OPERATOR'S MANUAL

Model AT 9500
Digital Transmission Analyzer

Scientific
Atlanta

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Vational Co.
IA 01041

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Made in USA

OPERATOR'S MANUAL

Model AT 9500
Digital Transmission Analyzer

Scientific
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CHAPTER 1
SAVE TIME BY USING YOUR MANUAL

WHAT YOUR MANUAL INCLUDES

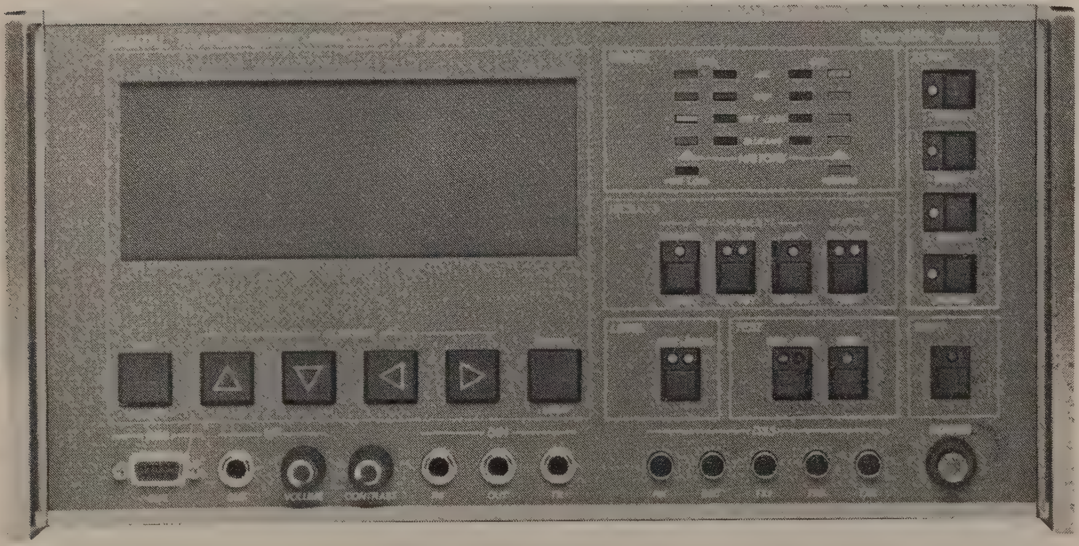
This Operator's Manual contains information for installing and operating the Scientific–Atlanta Model AT 9500 Digital Transmission Analyzer.

CAUTION

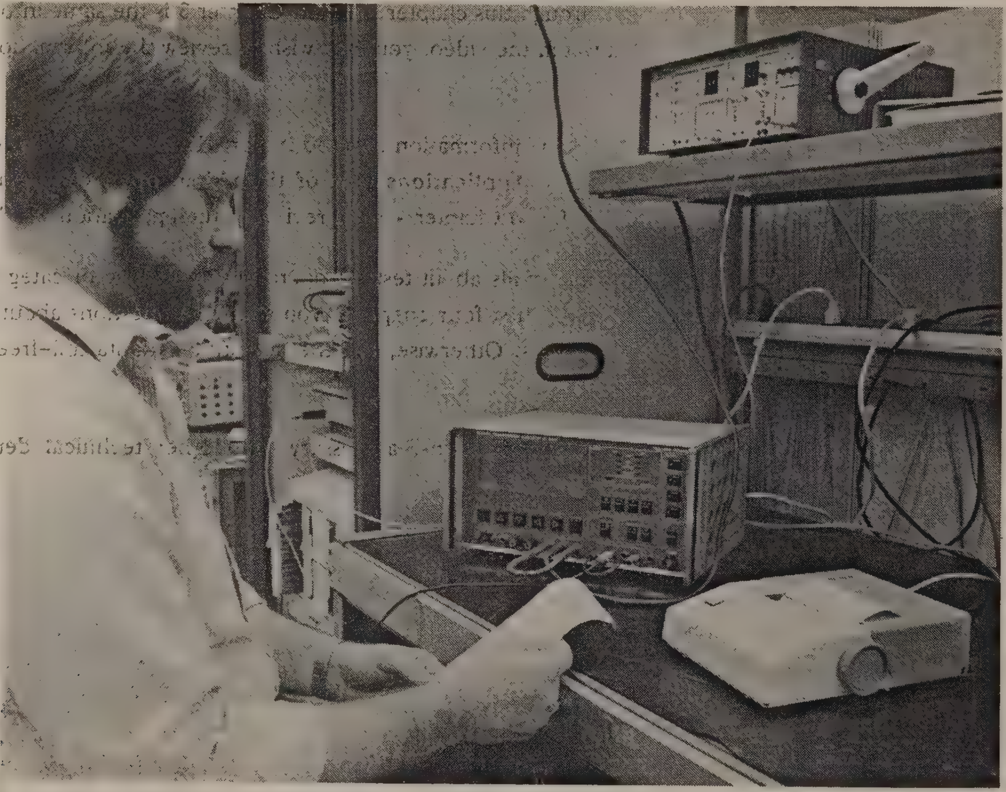
Do not operate the AT 9500 until you read Chapter 2 of this manual.

An Update Information envelope inside the back cover of this manual contains information regarding recent changes made to the AT 9500.

This manual does **not** include maintenance information. Maintenance information is contained in a separate Service Manual.



The AT 9500 Digital Transmission Analyzer



The AT 9500 In Use with a Printer

THIS MANUAL IS DESIGNED TO HELP YOU

This manual is different in two ways from other equipment manuals you have used.

First, it has been specially designed to help you find information quickly and easily. Charts and tables you'll refer to frequently are located on the appropriately tabbed pages of Chapters 5 and 6.

Second, this manual can be used along with the AT 9500 Training Video. The video and manual have been designed to work together to teach you how to use your test set.

Read this chapter first so you'll know how to use the manual. Then read Chapter 2, EVEN EXPERTS SHOULD READ THIS, as you prepare to unpack and safely install your test set.

Chapter 3, QUICK–LOOK USER'S GUIDE, describes the many AT 9500 features and easy operation of the test set. Even if you have already seen the AT 9500 in operation, you will probably learn a lot more about its capabilities by reading through this chapter. In fact, Chapter 3 is the same information covered in Part I of your video. After you watch the video, you may wish to review the information about AT 9500 features in Chapter 3.

Chapter 4, APPLICATIONS, is the same information covered in Part III, the Applications part of your video. **When you are ready to watch the Applications part of the video, open your manual to Chapter 4.** The video will tell you when to refer to Chapter 4 for a review of the application you learned.

Chapters 5 and 6 give you additional details about test set operation in a range of categories. If, after you watch the video and read through the first four chapters, you still have questions about the AT 9500, Chapters 5 and 6 should have the answers. Otherwise, call the Scientific–Atlanta toll–free service number 1–800–541–4201.

Finally, the APPENDICES include specifications, a glossary, and other technical details not already covered in the manual.

AT 9500 Remote Control Operation

CHAPTER 2

EVEN EXPERTS SHOULD READ THIS

This brief chapter includes complete unpacking, safety, and installation instructions. **Please follow these instructions as you unpack and prepare to install your new equipment.**

UNPACKING

Carefully unpack the shipping cartons, observing printed instructions. Separate the packing material from the main unit and any packages of loose accessories. Save the shipping cartons, packing material, and shipping papers. Inspect the unit and accessories for shipping damage. If you notice damage, contact both the carrier and the nearest Scientific-Atlanta sales representative immediately. Do not return the unit until you receive specific instructions from Scientific-Atlanta.

The following list describes the accessories provided with your unit:

- Operator's Manual (Part No. 320040)
- AT 9500 Training Video (Part No. 306245)

Also make sure you have received one each of the following fuses:

Voltage Selector	Fuse Type	S-A Part No.
115V	4A	71229
230V	3A	71227
DC Option -24V	6A	84588
DC Option -48V	3A	71227

If any of the above accessories are missing or damaged, contact your local Scientific-Atlanta representative or call toll-free, 1-800-541-4201.

SAFETY

Do not apply power to the AT 9500 Test Set until you read the following safety information:

Grounding: This unit is grounded through a ground conductor of the power cord. To avoid electrical shock, connect the power cord only to a properly wired receptacle that provides a ground connection. **This is essential for safe operation.** If this protective ground connection is not provided, any accessible conductive part of the unit can carry an electrical shock.

Fuses: To avoid a fire hazard, only use fuses of the type, voltage, and current rating specified.

Power Cord: Use only the power cord specified. The stackable plugs on the power cord are rated for 15 amps maximum.

Covers: Do not remove the instrument's covers while power is on. Do not operate the instrument without properly installed covers.

NOTE

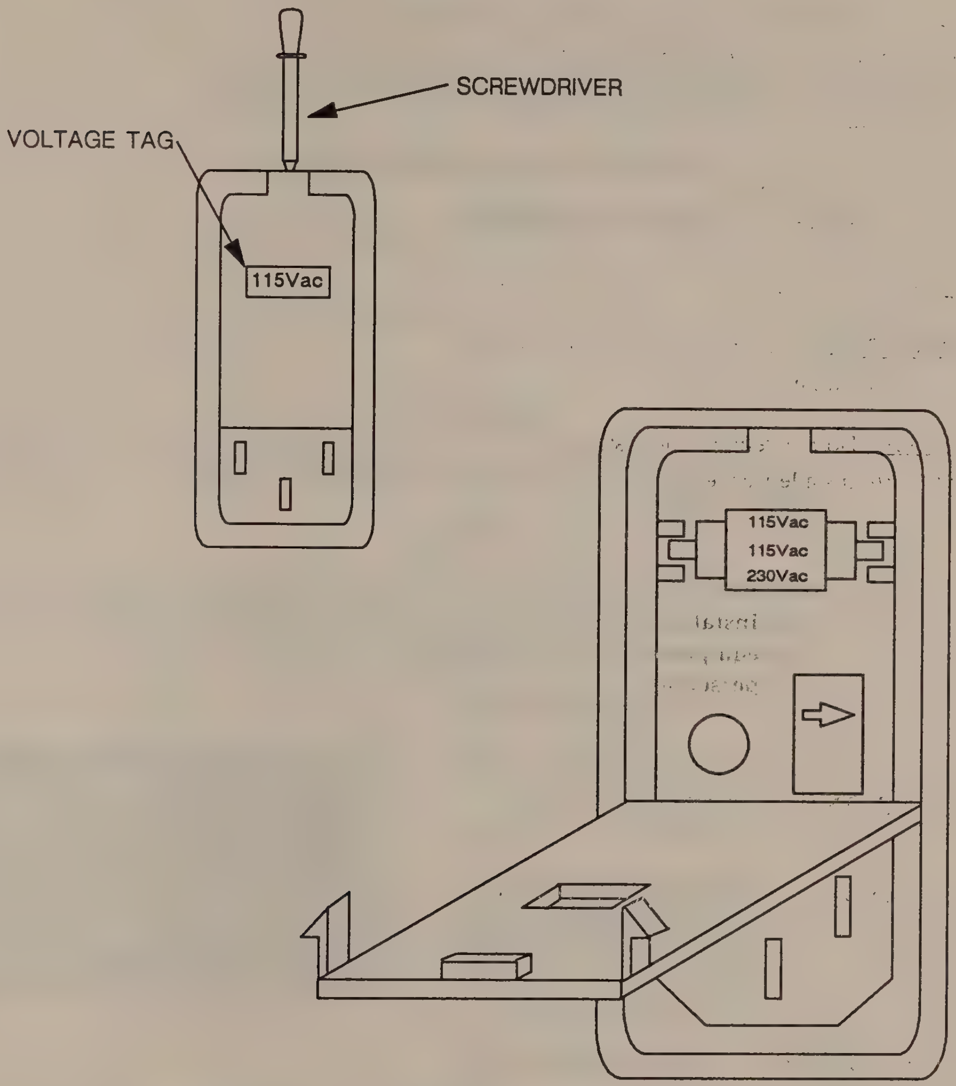
Installation, maintenance or service of this equipment must be performed only by trained personnel.

INSTALLATION

The AT 9500 is simple to install. The only installation requirement consists of applying power to the instrument. An option to the unit allows rack mounting in either 19" or 23" equipment racks.

POWER SOURCES

The AT 9500 can operate from either an ac or dc supply, and has been factory-selected for your application. Direct current operation is available as an option (-2). The following instructions tell you how to apply power to the instrument. See the following figure for the location of the fuses and voltage selector wheel.



Selecting the Operating Voltage

CAUTION

Damage to the AT 9500 may result if:

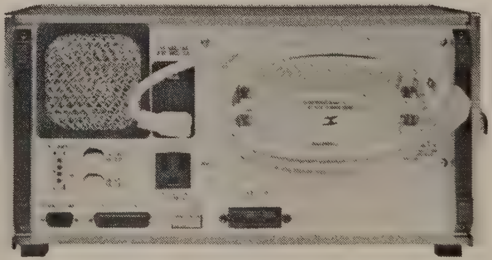
- **operated with the line voltage selector set for the wrong ac line voltage**
- **dc power source is connected improperly**
- **wrong fuses are installed.**

AC OPERATION

WARNING

TO AVOID SERIOUS INJURY, DISCONNECT THE AC POWER CORD.

1. Set the rear panel voltage selector wheel to the position corresponding to the line voltage at your location (do not select 115 Vac if you are in a building wired for 230 Vac). To change the selected voltage,
   - disconnect the power cord
   - open cover with a small blade screwdriver or similar tool
   - insert the tool into the voltage selection slot and remove wheel from unit
   - select desired voltage
   - replace wheel into unit
   - ensure the proper fuse is installed for the operating voltage
   - close cover
   - make sure the selected voltage appears in the connector window



2. Set the Front Panel **POWER** switch to OFF. (The switch appears black.)
3. Connect the ac power cord to the rear panel input connector. Plug the other end of the power cord into a three-terminal grounded outlet.

4. Turn on power to the AT 9500 by pressing the Front Panel **POWER** switch. (The switch appears green.) Verify the following after power-on:

   - The audible alarm in the test set beeps twice.
   - The front panel **Status** LEDs light simultaneously for approximately 3 seconds.
   - The liquid crystal display (LCD) lights.
   - The AT 9500 does a Self-Test and indicates the PASS/FAIL result on the LCD.
   - The **DS3/DS1 Status** page appears on the LCD after 3 seconds.

DC OPERATION (OPTION -2)

CAUTION

Be sure the Front Panel POWER switch is in the OFF position before connecting battery source voltage. Although the circuits are voltage protected, it is possible to blow a protecting fuse. These fuses are mounted internally and require partial disassembly for replacement.

WARNING

ENSURE THE GROUND CONNECTION IS MADE INDEPENDENTLY OF THE POSITIVE AND NEGATIVE TERMINALS, OTHERWISE POWER MAY CONDUCT THROUGH THE FRONT PANEL SIGNAL CONNECTORS.

NOTE

Only use the AT 9500 with a positive grounded supply. A negative grounded supply will damage the test set.

1. Verify installation of the proper fuse in the rear panel fuse holder.
2. Connect the dc power cord to the rear panel dc power connector.

3. Turn on the AT 9500 by pressing the Front Panel **POWER** switch. (The switch appears green.) Verify the following events occur after power–on:
   - The audible alarm beeps twice.
   - The front panel LEDs light simultaneously for approximately 1 second.
   - The liquid crystal display (LCD) lights.
   - The AT 9500 does a Self–Test and indicates the PASS/FAIL result on the LCD.
   - The **DS3/DS1 Status** page appears on the LCD.

RACK MOUNTING THE AT 9500

You can rack mount the AT 9500 in standard 19" and 23" racks using either 19–inch (P/N 327955) or 23–inch (P/N 327956) standard rack mount kits. Do the following to rack mount the test set:

- Remove the two screws that secure the small side plate assembly.
- Install the rack brackets, flange side inward.
- Install the screws to mount the brackets to the chassis and mount the unit into the rack.

CHAPTER 3
QUICK-LOOK USER'S GUIDE

NOTE

This chapter includes the same information as Part I of the AT 9500 Training Video. Use it to familiarize yourself with the many easy-to-use features and front panel operation.

FEATURES

The AT 9500 is a comprehensive telecommunications test instrument combining the features of several sets in one convenient package. This set performs a range of tests for DS3 and DS1 facilities, including demultiplexing from DS3 to DS0 and numerous other support functions. The test set is completely portable, weighing only 17 pounds. Here are just a few of its many innovations:

1. With just one AT 9500, you can perform an entire range of tests:
   - out-of-service
   - end-to-end
   - loopback
   - in-service and thru-mode tests that regenerate DS1 and DS3 signals.
2. The AT 9500 offers a number of user help features, such as:
   - Automatic Frame and Pattern Detection for both DS3 and DS1 signals
   - Help Menus for every function
   - a non-volatile RAM memory that lets you store and recall over a dozen frequently used tests.

   You can also protect the integrity of your preset tests by using the EZ-mode. When selected this mode prevents anyone from changing the Receiver or Transmitter setups. This feature is especially important when novice or non-technical personnel conduct tests.
3. The AT 9500 also features a Signal Analysis option for waveform and frequency measurements. This option measures DS3 and DS1 bipolar pulses and compares them to industry standard templates.
4. Finally, included with the AT 9500 is a complete set of training materials that explains, step-by-step, the set's easy-to-learn operation.

The AT 9500 test set saves you time and is very simple to operate. Clearly labeled sections on the front panel contain a minimum number of keys. The most frequently used functions are accessible with only one key stroke. And here's a big time-saving benefit: the AT 9500 prints or displays only the information you request, so you can quickly focus in on the data vital to your test.

A large backlit liquid crystal display (LCD) screen with a contrast adjustment knob makes the display easy to read. All of the Setup modes operate in a convenient and familiar spread sheet-like format. You simply press cursor keys to move and change test settings.

Another time-saving feature of the AT 9500 is that you can access all functions by descending **no** more than two **page** levels. This means you are far less likely to get lost or confused trying to set up tests. If you should need additional information, **HELP pages** are available with only a single key press.

You have two options for control of the AT 9500. The test set can be operated either from the front panel or by a remote controller terminal.

A portable 80-column printer is available as an option, or you may use your own serial printer when you require hard copy test results.

TEST SET CONFIGURATION

The basic configuration of the AT 9500 includes the following:

- DS3 and DS1 Bit Error Rate Measurements
- DS3 and DS1 transmit capability
- DS3 to DS1 to DS0 demultiplexing
- Thru-Mode regenerator capability with error insertion for both DS3 and DS1
- Front Panel and remote controller test capability
- Nonvolatile RAM memory to store preset tests.

DEMULTIPLEXER

The AT 9500 demultiplexing capabilities let you demultiplex and monitor any one of 28 DS1 channels from an incoming DS3 signal. At the same time, it allows comprehensive status monitoring on the DS3 input. It also provides detailed status information on the DS1 signal. The test set includes an output jack for the demultiplexed DS1.

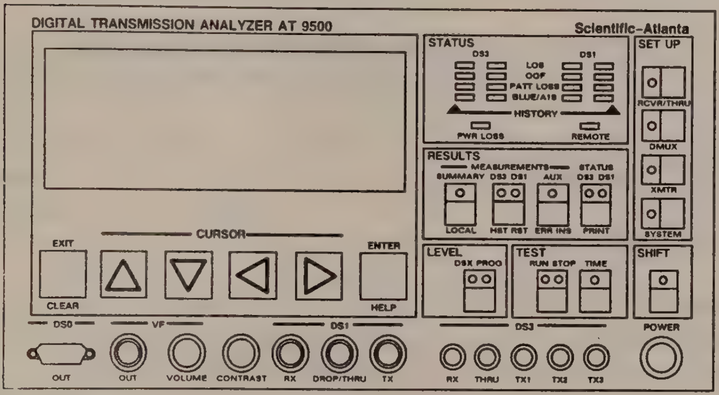
DS1 to DS0 demultiplexing allows you to demultiplex any one of 24 channels from a directly input or demultiplexed DS1 signal. The voice channel is available at front panel jacks as a Voice Frequency (VF) and 64k-bit digital signal, or as an audio output through a built-in speaker.

BERT FUNCTION

The Bit Error Rate Measurement feature includes the ability to test and monitor the DS3 and selected DS1 signals from the DS3 input. In addition, you can perform Bit Error Rate measurements on independent DS3 and DS1 input signals. The DS3 and DS1 Transmit feature provides various test patterns at standard industry interface levels. The AT 9500 also has a Thru-Mode feature that regenerates DS3 and DS1 input signals, allows bridge-mode monitoring and can insert errors on the thru-mode traffic.

AT 9500 FRONT PANEL

The AT 9500 Test Set has eight different sections on the front panel:



Connectors
Display
Status
Results
Setup
Level
Test
Shift

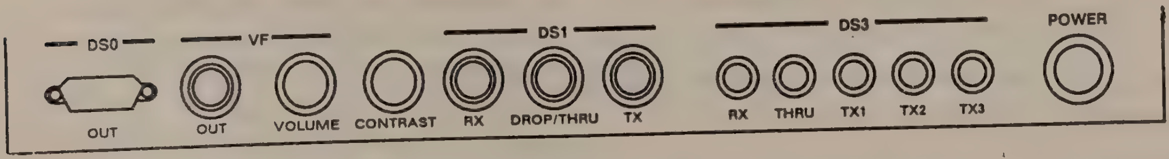
Each of the sections is clearly labeled, color-coded and blocked out.

By pressing a key, you instruct the set to perform the indicated primary function. If you wish to use a function indicated in red letters, press the **SHIFT** key and then press the appropriate function key.

The following paragraphs highlight each section on the front panel.

Connector Section

The first section we'll examine is the Connector Section. Let's begin with the DS3 area.



Notice that there is one DS3 receiver input jack and three DS3 transmitter output jacks. The **DS3 THRU** jack provides you with a DS3 signal which is regenerated from the receiver input. No matter what the receiver input level, the regenerated output level is always at the cross-connect level.

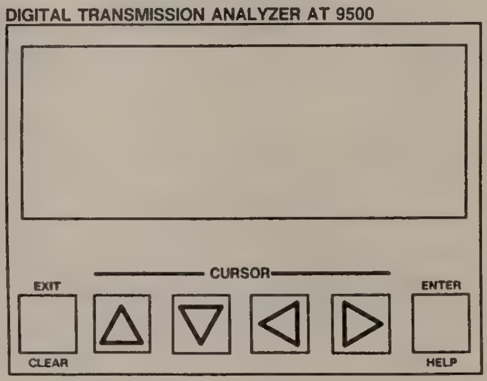
The jacks under the DS1 heading are similar to the DS3 jacks -- but with one receiver input and one transmitter output. The **DROP/THRU** jack allows you to perform two operations:

- Regenerate a DS1 signal applied to the DS1 receiver input
- Output the DS1 which is demultiplexed from the input DS3 signal.

The last Connector section is the **DS0** and **VF** outputs. The AT 9500 has the capability of demultiplexing DS0s from either a DS3 or a DS1 input. The DS0 output can be supplied to a DS0 Bit Error Rate Test (BERT). In addition to the DS0 output, there is also an analog VF output. The AT 9500 supplies this output to a speaker so you can hear test tones or conversations in either the DS3 signal or the DS1 signal.

For more information on the Connectors see Section 5.2.

Display Section



The Display Section uses a large, backlit, easy-to-read liquid crystal display to show measurement results and setup parameters of the tests you perform.

Each Display screen is referred to as a "**page**" of information. This **page** is especially useful in the Measurement Display mode, where a large amount of information is displayed clearly.

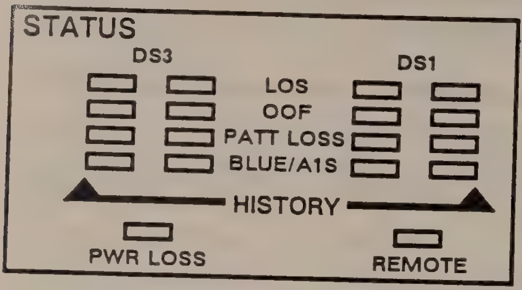
Use the **CONTRAST** knob in the Connector Section to optimize the display for your viewing angle.

Now notice the four cursor keys below the Display screen. By pressing these keys, you are able to move through display **pages** in every direction -- ▲, ▼, ◀ and ▶, enter and exit. When you wish to select a test parameter, press the **ENTER** key. If you have trouble or forget exactly how to setup a test, just press the **SHIFT** key and then press **HELP**. The screen will tell you what to do.

The **EXIT** key moves the ■ from the current activity to the page heading or previous page. Pressing the key several times brings you back to the Summary Results page.

By pressing the **SHIFT** key and then **CLEAR**, you instruct the test set to clear the last data entered in a data field. Press the **SHIFT** key and then **CLEAR** to clear additional data entries.

Status Section



Now look at the Status Section on the front panel of the AT 9500 test set.

This section uses LEDs to inform you of important conditions in DS3 and DS1 signal status, both current and historical.

Red LEDs indicate the Current Status of the input signal and yellow LEDs indicate History Status. The Current Status signifies a signal condition which exists now. The History Status indicates a signal condition changed during a test. The History Status LEDs can be cleared at any time by simply pressing the **SHIFT** key and the **HST RST** key.

The Status conditions which are monitored at DS1 and DS3 include **LOS** (Loss of Signal), **OOF** (Out of Frame), **PATT LOSS** (Pattern Loss), **BLUE** in DS3 and an **A1S** (All Ones Alarm) at DS1.

The Status Section also includes a **PWR LOSS** History LED, which lights to indicate a power loss occurred during the current test, and a **REMOTE LED**, which means the test set is controlled remotely by a computer or data terminal.

Section 5.11 has more information on the Status LEDs.

Results Section

The keys in the Results Section control the display of all the measurement results of the current test. The LCD displays the selected results.

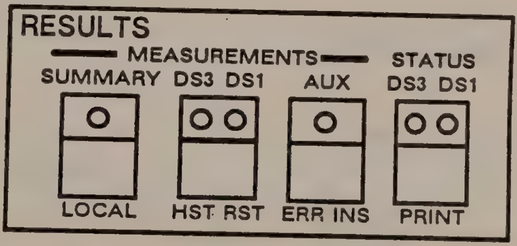
There are four keys in the Results Section:

SUMMARY

DS3 and DS1 MEASUREMENT

AUX

DS3 and DS1 STATUS



The keys on either end of the Measurement Results section, the **SUMMARY** key and the **STATUS** key, provide quick access to important test results. The information is presented in a single page format and is available with the press of a single key.

The **SUMMARY** key displays all of the available DS3 and DS1 error second measurements on a single page. By pressing the **SUMMARY** key a second time, the display shows DS3 and DS1 error rate measurements.

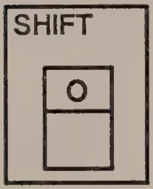
The **STATUS** key logs and displays a summary of both the DS3 and DS1 status changes, plus provides signal, frame, pattern and other alarm and status information.

The **DS3/DS1 MEASUREMENT** key will display separately or simultaneously all selected error information accumulated during your current test.

The **AUX** key provides access to optional features. For instance, it provides for the set up and results display of the Signal Analysis option.

Refer to Section 5.13 for more information on the Results keys.

Now we'll review the shifted functions.



By using the **SHIFT** key in conjunction with the keys in the Results Section, you have access to additional features. Look at the **LOCAL** key. Remember from the explanation of the Status Section that when the **REMOTE LED** is ON, the test set is controller operated. When you want to change from the controller to front panel control, press the **SHIFT** key and then press the **LOCAL** key to disable controller operation.

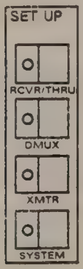
To clear the **HISTORY STATUS** LEDs, press the **SHIFT** key and **HST RST** keys.

You can insert errors into the transmitted and thru-mode **DS3** and DS1 signals by pressing the **SHIFT** and **ERR INS** keys. Single errors can also be selectively turned off for thru-mode, DS3 or DS1 transmitted outputs with the **XMTR** and **THRU Mode page** in the **Setup** Section of the test set.

If you want to connect the test set to a printer, press **SHIFT** and **PRINT** to produce a hard copy of the current Measurement and Status results.

Chapter 5 provides additional details about how to use your test set.

Setup Section



Look at the Setup Section. Each of the keys relates to a testing mode.

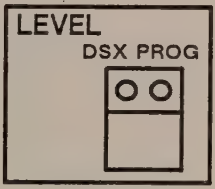
The first key is **RCVR/THRU**. Under receiver Setup, both the DS3 and DS1 receivers can be configured. The **RCVR/THRU** key allows you to tailor the display, thresholds and printer outputs to get exactly the results you desire. See Section 5.4 for more information.

The **DMUX** key allows you to select any one of the 28 DS1 channels to be demultiplexed, monitored and output from the DS3 input signal. In addition, you can demultiplex any one of the 24 DS0 channels that make up a DS1 signal. See Section 5.5 for more information.

The **XMTR** key allows you to select various DS3 and DS1 frame types, test patterns, error types and error rates to transmit into the network. See Section 5.6 for more information.

Another helpful and time–saving feature of the AT 9500 is its ability to store and recall frequently used test configurations. The **SYSTEM** key allows selection of this function. First, store preset tests you use most frequently. Then, at the test site, simply recall one of the stored tests, and the test set will perform it automatically. Other functions performed under the **SYSTEM** key include RS–232 Serial interface and printer setup selections, as well as IEEE–488 interface information. See Section 5.7 for more information.

Level Section

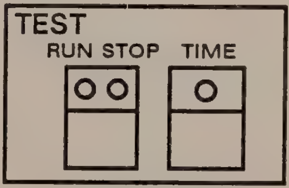


The **DSX** key in the Level Section lets you configure DS3 and DS1 inputs and outputs so they will transmit and receive a cross–connect level signal. The **PROG** key defaults the receiver inputs and transmitter outputs to other network levels selected in the Setup section.

See Section 5.3 for more information on the Level key.

Test Section

The Test Section has two keys –– **RUN/STOP** and **TIME**.



The **RUN/STOP** key starts and stops your tests. A green LED below **RUN** indicates a timed test is running. The red LED below **STOP** means a timed test has been stopped. **To ensure test results are not corrupted, many Setup parameters cannot be changed unless the AT 9500 is in the STOP mode.**

The **TIME** function allows you to select the type of timed test to run. There are three selections: Untimed, Single and Repeat test modes.

An Untimed, or Elapsed test, begins counting at time equals zero and continues counting until you stop the test. A Single timed test begins at zero, counts up to a programmed time, and concludes the test. A Repeat timed test begins at zero, counts up to a programmed time, and repeats the test over and over until you stop the test. In addition, the real time clock and calendar can be set using the time function.

See Section 5.12 for more information on the Test keys.

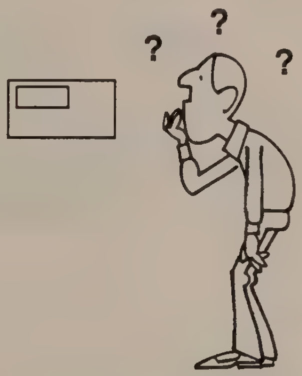
We've now completed our tour of the AT 9500 front panel functions. Please return to any of the sections in this video you wish to review, or refer to the appropriate sections of your Operator's Manual.

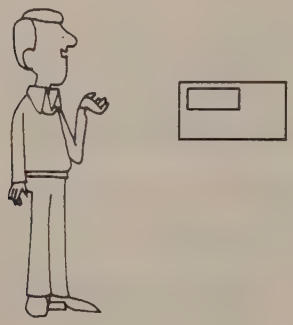
CHAPTER 4
APPLICATIONS

BASIC

At this point, we'll go through several basic applications using both in-service and out-of-service testing at the DS3 and DS1 level. The Basic Applications are easy to perform. If possible, follow along on your set with the video.

Once you know how to perform the basic tests, it will be easy to configure the test set to perform more sophisticated tests. The Operator's Manual includes step-by-step instructions for a number of AT 9500 tests. You will find these instructions in the Advanced Applications section.





This section also instructs you how to hook up a printer to the test set and how to interpret the results of the printouts.

DS3 IN-SERVICE TESTING

Here's your first application: DS3 in-service testing. The AT 9500 is very simple to use for live traffic testing. It has been designed to give you as much information as possible about a problem while customers continue to utilize your service.

During DS3 error testing, you'll be looking for:

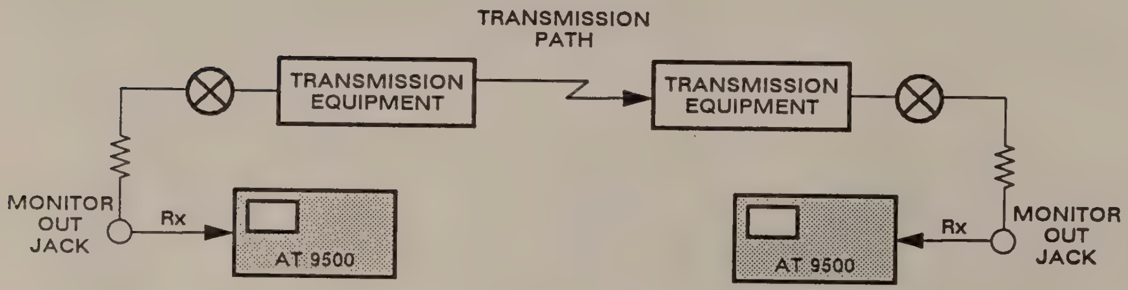
- error activity in the parity bits
- errors in the framing bits

The errors might occur in the DS3 signal while the customer is still in service.

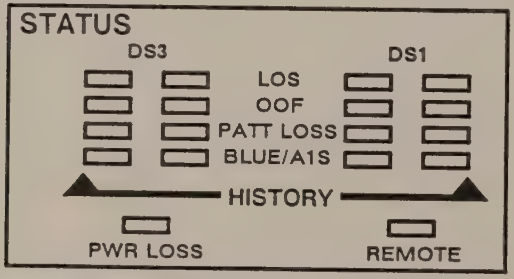
To setup this test, connect the DS3 receiver to the DS3 monitor jack.

NOTE

Please remember that during all setups, the AT 9500 must be in the **STOP** mode. If you try to change a test setup while the unit is in the RUN mode, the set will beep and display the words **"NOT ALLOWED WHILE TEST IS RUNNING"**.



While you're setting up, take a look at one of many AT 9500 features that simplifies operation. It's called the Auto Sync Mode. Auto Sync recognizes the received frame and pattern types. This means you do not have to instruct the receiver to search for a particular frame format or pattern -- the test set finds the match. If it cannot find a matching or repeating pattern, it declares the pattern live traffic.

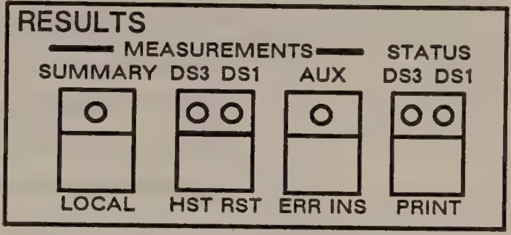


Back to setup. You've connected your receiver. Now, look at the LEDs in the **Status** Section. They will inform you that the set is receiving the signal. They'll also indicate the signal condition. Signal conditions include Frame and Pattern Sync and Blue or All Ones Alarm indications.

The AT 9500 indicates there is a DS3 signal, since the Loss of Signal -- or **LOS** -- LED is OFF. When the Out of Frame -- or **OOF** -- LED is OFF, the test set is receiving a framed signal. When the **PATTERN LOSS** LED is active, the test set does not recognize the pattern. This LED will always be lit when analyzing live traffic.

At this point, you can start your test. Press the **RUN** key.

Now select the **SUMMARY** key in the Results Section to view test results and see if your test has located any problems. Check the display. Summary information is provided for all relevant DS3 measurements. These measurements include:



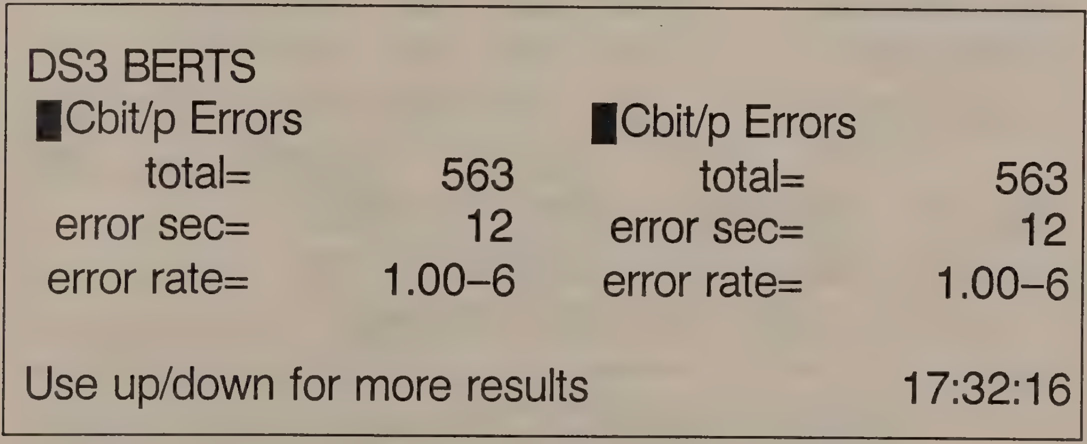
- Bipolar violation
- frame bit
- parity
- C–bit error types

Each error type is categorized in the error second format. Therefore, any second which has one or more error events is logged to this display.

Look at the bit and febe (far end block error) summaries. They indicate an N/A or **not applicable** status. That's because you cannot make bit error measurements on live traffic or febe errored seconds measurements on the standard M13 frame format. Febe measurements are only valid in the C–bit parity frame format. The AT 9500 will help by reminding you when measurement types are non–applicable.

Now, review the Summary page.

The test has logged framing bit error seconds. For more information, go to DS3 Measurement pages.



```
DS3 BERTS
█Cbit/p Errors                      █Cbit/p Errors
      total=          563                 total=          563
  error sec=           12             error sec=           12
 error rate=       1.00-6            error rate=       1.00-6

Use up/down for more results                         17:32:16
```

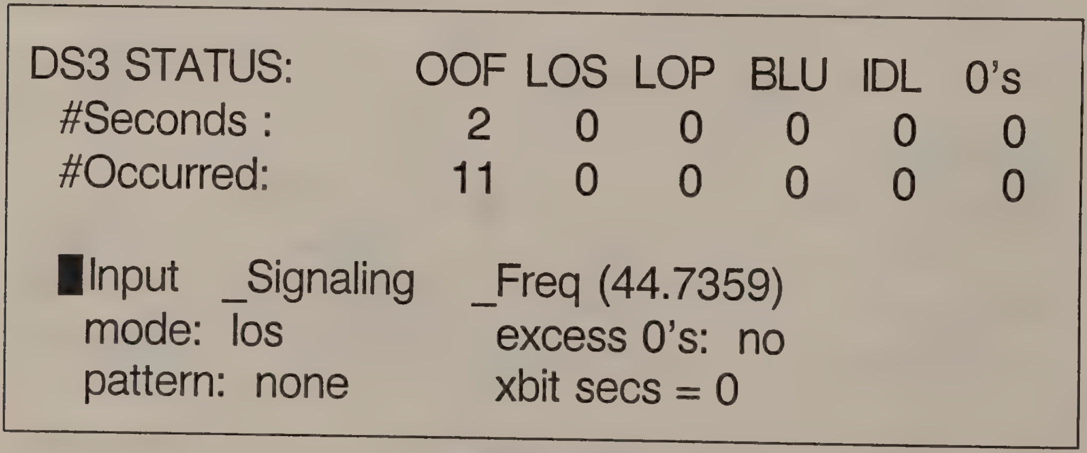
DS3 Measurement Page

Select Framing Bit (F-bit) Errors since that's where the problem is. Now you'll see how the errors are being accumulated. The test set gives you the reading:

- F-bit errors total equals 5.
- Error seconds equal 5.
- Dribbling errored seconds equal 5.
- Bursty errored seconds equal zero.
- Severely errored seconds equal zero.

Suppose while monitoring this circuit, you leave for lunch. When you return, first look at your History LEDs in the Status Section. For example, the LEDs might indicate there's been a loss of signal in DS3 while you were away. Whenever a loss of signal occurs, an out- of-frame and loss of pattern condition will also occur. Now you can track this specific information with your test set to help solve the problem.

Under the Results Section, look at the DS3 Status **page**. Check the Loss of Signal and Out-of-Frame status. From this **page** you can tell how many seconds the Loss-of-Signal status condition lasted and how many times it occurred. In addition, the Status **page** allows you to isolate the causes of other problems. Check for excess zeros and DS3 X-bit alarms. You can check DS2 framing by moving the cursor to DS2. Now you can check for out-of-frame seconds and number of occurrences, DS2 X-bit alarms and all-ones alarms.



```
DS3 STATUS:        OOF  LOS  LOP  BLU  IDL  0's
  #Seconds :         2    0    0    0    0    0
  #Occurred:        11    0    0    0    0    0

 █Input   _Signaling   _Freq (44.7359)
   mode:  los            excess 0's:  no
   pattern:  none        xbit secs = 0
```

DS3 Status Page

You've now completed a brief example of DS3 in-service testing using three basic steps:

- First, you plugged the test set into the monitor jack.
- Then you pressed **RUN** to start the test.
- Third, you used the Results **pages** to analyze the signal you received.

If you want to make DS1 in-service tests, the procedure is almost the same. The only difference is that you plug the outjack into the DS1 receiver input, or, select a demultiplexed DS1 to analyze from the DS3 input. The AT 9500 can simultaneously run a DS3 test and a DS1 test.

DEMUX TESTING

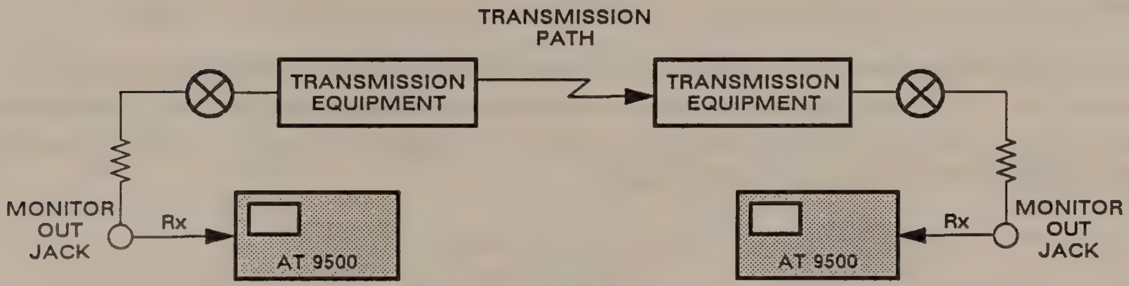
One of the most unique features of the AT 9500 is that it allows you to access the network at DS3 and monitor both the DS3 and individual DS1s in the DS3. This is called demultiplex testing. You will now learn how to perform a demultiplex test with the AT 9500.

Before you begin, make sure your set is in the **STOP** mode.

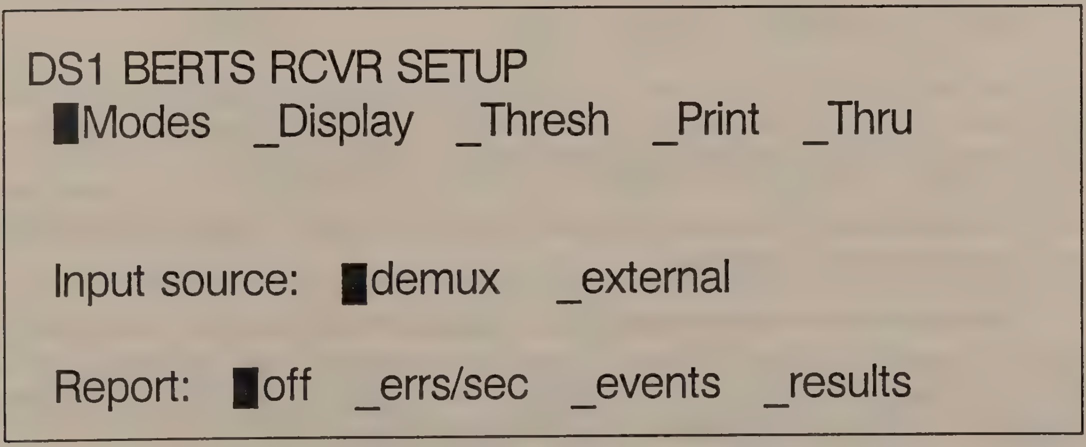
For a demultiplex test, you must:

- check the setup of the DS1 receiver
- select the appropriate DS1 channel to demultiplex.

First, plug the DS3 RX into a cross-connect monitor jack.



Next, select **RCVR/THRU** Setup key.



```
DS1 BERTS RCVR SETUP
 █Modes   _Display   _Thresh   _Print   _Thru


 Input source:  █demux   _external

 Report:  █off   _errs/sec   _events   _results
```

Now, select DS1 BERTS by pressing the ▼ key and pressing **ENTER**. The first selection on the **page** is **Modes**. Under this **page** is the selection **Input Source**. The choices are **Demux** or **External**. If you select **Demux**, the receiver monitors a DS1 dropped from a DS3. If you select External, the receiver monitors a DS1 which is plugged into the front panel. For the demux test, the Input Source must be in the demux mode. Use the ▼ key to access the Input Source. Use the ▶ key to select Demux. The test set will now analyze DS1s demultiplexed from a DS3 input.

The AT 9500 allows you to analyze any one of 28 DS1s from the DS3 input. To select a specific DS1, again go to the Setup Section of the front panel. Select the **DMUX Setup** key.

The Demultiplexer Setup **page** has two selections:

- DS3 drops DS1, allows you to select which one of 28 DS1s you want to drop from the DS3.
- DS1 drops DS0, allows you to select which one of 24 DS0s you want to drop from the DS1.

In addition, the Demultiplexer Setup **page** provides you with frame and pattern information for both the DS3 and the DS1 signals. This is very useful if you want to quickly scroll through all 28 DS1s in the DS3 and locate a DS1 carrying a preselected test pattern.

Part of demultiplexer testing may include DS0 or VF tests. Through the internal speaker, the AT 9500 allows you to select test tones or voice conversations out of the chosen signal channel.

Besides being routed to a speaker, the VF signal is routed to a front panel connector. The corresponding DS0 digital signal is also routed to the front panel of the test set. The VF output and DS0 output can be used to provide input test signals to other test equipment. If you wish, adjust the internal speaker volume with the volume control knob.

After you select the appropriate DS1 and DS0 channels, you can start a test.

Press **RUN** to begin the test and select the **SUMMARY** key in the Results Section to monitor error activity. If you detect any error activity, select the Measurement **pages** to determine the nature and severity of the problem.

Take a closer look at the Measurement **pages**.

The Measurement **pages** are divided into DS3 and DS1 **pages**. An LED below each selection indicates which **page** is active. The display is divided in half so that two error types can be displayed at the same time. The flashing ■ indicates which half of the display can be changed.

To scroll through the measurement types, use the ▲/▼ keys. Each valid error type and measurement category will be displayed.

To change the other half of the measurement display, use the ▶/◀ keys to move the ■. Scroll through the display with the ▲ and ▼ keys. To change the measurement results from DS3 to DS1, press the **MEASUREMENT** key. The display now indicates DS1 error results. Press the **MEASUREMENT** key again and both DS3 and DS1 measurements can be displayed simultaneously.

From here the demultiplex testing procedure is the same as the in-service test procedure.

You've now completed a sample demultiplex test by adding some basic steps to the first example. You:

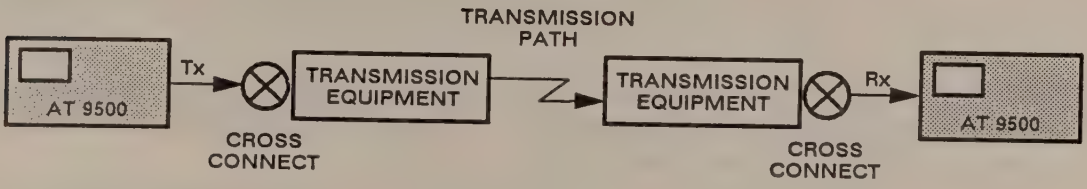
- accessed the network at the DS3 monitor point
- went to the Setup Section, selected DS1 **RECEIVER** and made sure the mode was selected for **DEMUX**
- used the Demux Setup **page** to choose the DS1 and DS0 channel to monitor. By pressing **RUN** and **RESULTS SUMMARY**, you can monitor the DS3 signal plus the demultiplexed DS1.

See Section 5.5 for additional details about Demultiplexer operation.

OUT-OF-SERVICE - DS3

Next you'll perform an out-of-service test at the DS3 rate. During out-of-service testing, you need to use the Transmitter Section of the AT 9500 as well as the Receiver Section.

Make sure you are in the **STOP** mode. The first step is to setup the transmitter for an out-of-service test.



Under the **Setup** section of the test set, select **XMTR** and press **ENTER** to select the DS3 Transmit setup. The first selection is **Output**. Check to see that the framing is set for **M13**, the **Level** is set for **dsx** and the pattern is **PRBS 15** (PRBS 2^{15} – 1), sometimes referred to as the QRSS pattern.

Next, plug one of the three DS3 transmitter outputs into the DS3 receiver input. Examine the current DS3 Status LEDs to determine if the test set has locked on to the transmitted signal.

Remove the receiver input and plug the transmitter output into the injack of the circuit to be tested. This test will be performed in the loop-back mode, so you must patch the remote end of the circuit back to your local end. This is accomplished at the remote site by connecting the outjack to the injack of the cross-connect associated with the circuit being tested.

Before the loop-back is performed, apply the DS3 outjack to the DS3 receiver input. Now, when the loop-back is performed, the DS3 Status indicators will recognize the signal, frame and pattern.

To ensure the test set has continuity between the receive and transmit, insert a single error. To do this:

- First go back to the Summary Results **page** so that you can see the error when it occurs.
- Next, start the test by pressing **RUN**.

To insert single errors, press **SHIFT** and **ERR INS**. The Summary **page** should register one bit (bit es) error second, one bipolar violation error second (bpv es), and one frame bit error second (fbit es) if the test path is complete.

Now, insert errors at a constant rate.

- First, stop the test. Under the **Setup** section, select the **XMTR Setup** key
- Choose **DS3 BERTS**. Press **ENTER**.
- From the DS3 BERTS Transmitter **page**, move the ■ over to the **Errors** field.
- Go to the **Insert** field and select **ber**.

Select a bit error rate of (1×10^{-6}). By using the ▲/▼ keys, you can increase or decrease the error rate.

- After selecting an error rate of (1×10^{-6}), press **ENTER**,
- then select Err (Error Insert) type for **bit**. Press **ENTER**
- select the **MEASUREMENT DS3 page**, and then restart the test by pressing **RUN**.

As you can see after a few seconds, the measured value for the bit error rate averages out to (1×10^{-6}). To turn the errors OFF, select the **XMTR Setup** key, **DS3 BERTS**, and **Errors**. The **Insert** error mode should be left in the single error insert position.

Now you have completed a sample DS3 out-of-service test. Out-of-service testing at DS1 is very similar. The receive and transmit setups for DS1 are similar to the choices you had at DS3.

LOOP-BACK AND RESTORE CODES

The DS1 transmitter has preprogrammed standard Loop-Back and Restore codes. To access the codes, select **TRANSMITTER**. Move the ■ to **DS1 BERTS** and press **ENTER**. Now move the ■ to Loopback. To activate the Loop-Back or Restore code, move the ■ to the appropriate code and press **ENTER**. The test set will beep and flash a message indicating the code has been sent. The code will only be sent for a few seconds. Then the default test pattern selected under the Output **page** will be transmitted.

HELP

If during any part of your test setup you run into unfamiliar terms or are unsure of what to do, don't forget to use the **HELP** key. To activate **HELP**, press the **SHIFT** key and then the **ENTER/HELP** key. You will receive useful on-line information.

PRESET TESTS

Commonly used test configurations, such as the out-of-service test we just ran, can be saved in internal memory. These tests are referred to as Preset Tests. The AT 9500 set can store more than a dozen commonly used tests in internal memory.

To store the DS3 out-of-service test we just performed in memory, go to the Setup Section and press the **SYSTEM** key. The first selection is **Preset**. **Preset** allows you to:

- recall tests
- save tests
- delete tests

To save the test you just configured, move the ■ to **save** and press **ENTER**. The first category, called **select function**, asks you what type of test you want to save. The choices are:

- All Setups, which is a combination of Receiver and Transmitter tests and System Utilities
- EZ Mode test.

The Out-of-Service test includes both Receiver setup and Transmitter setup. In this example, you will select **All Setups**. Move the ■ to the **select function** field using the arrow keys, and select **ALL SETUPS**. Press **ENTER** and move the ■ to the **select preset** field. Here you can give your test an eight-character name. For the DS3 out-of-service test, use the name OUTTEST3. Use the ▲/▼ keys to scroll through the number and alpha characters. When the correct character is displayed, use the ▶/◀ keys to move to the next character. When the entire name is completed, press **ENTER**.

The final step is to save OUTTEST3 in memory. To do this, move the ■ down to **activate save** and press **ENTER**.

This test is now stored in memory. To recall the test, again select the SYSTEM Setup **page**. From Preset, move the ■ to the recall field, press ENTER and select the type of test desired. Recall the out-of-service DS3 test.

- Select **ALL SETUP**. Press **ENTER**.
- Select the preset test named OUTTEST3 by using the ▼ key to scroll through the various choices.
- Press **ENTER** and move the ■ to **activate recall**. Again press **ENTER**.
- Now all the test presets will be loaded into memory.
- To begin the out-of-service test, select the Summary Results **page** to display the measurements and press **RUN** to begin the test.

For novice users, there is an added feature called EZ Mode. The EZ Mode is a preset test, but the operator cannot change receiver or transmitter setups while in this mode. The EZ-Mode can simplify testing and help insure repeatable test results.

You have just completed an example of DS3 out-of-service testing, and learned how to use the **HELP** key. You have also completed an example of saving and recalling a Preset test.

For more information on the Loop-back and Restore codes, see Section 5.6.6. More information about saving and recalling tests is located in Section 5.7.1.

PRINTER CONNECTION

The AT 9500 has been designed for easy hook-up to a portable printer.

Start at the rear panel. There is an ac convenience outlet so you can plug your printer directly into the test set.

The printer and AT 9500 connect as shown in the following figure. If you are using your own RS-232C printer, you can use either the COM-1, 25-pin D-type, or the COM-2, 9-pin D-type input. The first step to connecting your printer is to note the baud rate for which your printer is set up. This information should be in your printer user's manual. Typical values are 1200, 2400, 4800 or 9600 Baud.

Also determine if your printer works in the hardware-handshake or three-wire mode. Most printers use the hardware-handshake mode.

To make the appropriate printer setup selection in the AT 9500, select the **SYSTEM Setup page**. Next, select **COMM** (see Section 5.7.3), which sets up the two serial communications ports on the test set. Select the baud rate and control mode appropriate for your printer, depending on the COM port you chose, COM1 or COM2.

Next, select the **Printer** mode to identify which serial port will be connected to the printer. The choices are **com2**, the 9-pin D-type connector, or **com1**, the 25-pin D-type connector. For additional information, see Section 5.7.4.

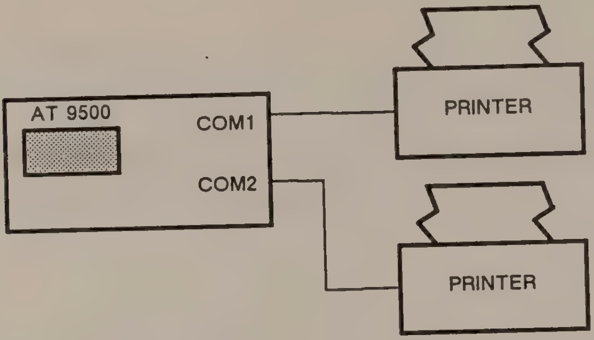
Other selections under the **Printer page** include:

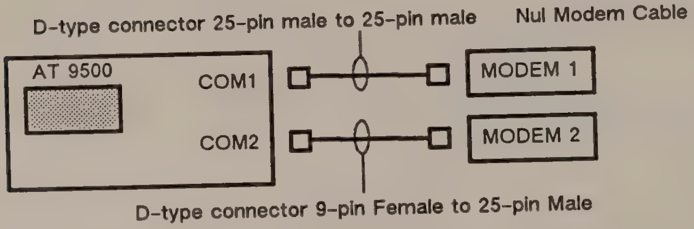
- **Timeline** printouts
- **Squelch** mode
- **Location ID**.

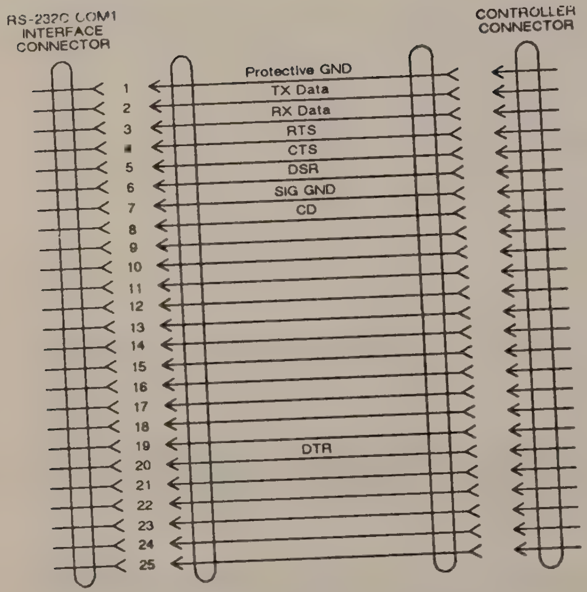
Timeline printouts print the time and date every half hour to ensure the printer is operating for long, uninterrupted tests.

Squelch mode limits the printouts to 10 consecutive errored seconds. The printer will stop printing and not resume until 10 consecutive clear error seconds occur. This keeps the printer from using all the paper when a lengthy error condition occurs.

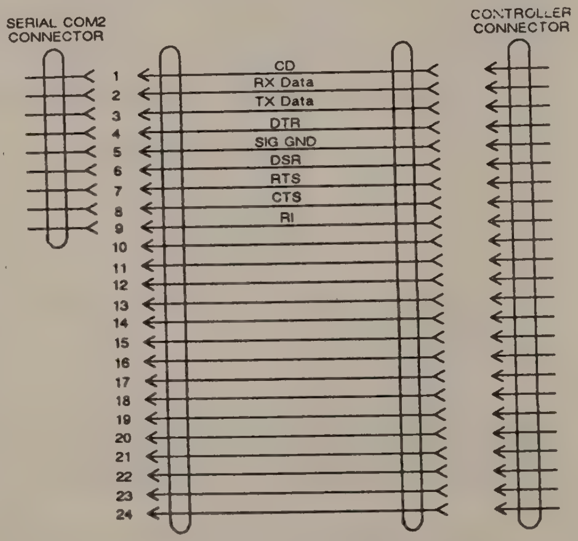
Location ID allows you to select a 10-character alphanumeric name which appears at the top of Results printouts. This identifies the location of the test results. Change characters in this field by using the (up/down) arrow keys.




D-type connector 25-pin male to 25-pin male
Nul Modem Cable
AT 9500
COM1
COM2
MODEM 1
MODEM 2
D-type connector 9-pin Female to 25-pin Male



Details of the 25-Pin Connector



Details of the 9-Pin to 25-Pin Connectors

Printer Connection

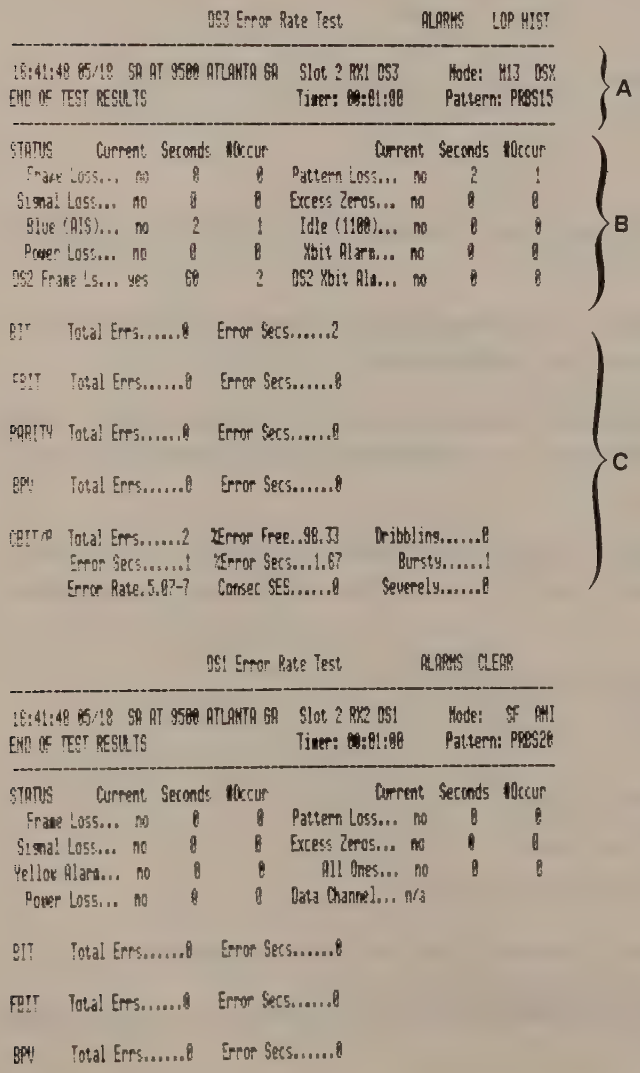
You have now completed the printer setup and are ready to test the printer. To force a printout:

- press **SHIFT**
- Then press **PRINT** under the **STATUS** key
- This will print out test results from the most current test.

PRINTOUT INTERPRETATION

Now take a look at some printed test results, and how to interpret them.

In this printout, you see the first test was at the DS3 rate, and there was a **LOSS OF PATTERN** occurrence in the History Status.



```
                  DS3 Error Rate Test          ALARMS    LOP HIST
-------------------------------------------------------------------
16:41:48 05/18  SA AT 9500 ATLANTA GA   Slot 2 RX1 DS3     Mode:  M13  DSX
END OF TEST RESULTS                     Timer: 00:01:00    Pattern: PRBS15
-------------------------------------------------------------------
STATUS      Current  Seconds  #Occur              Current  Seconds  #Occur
   Frame Loss...  no       0       0   Pattern Loss...  no       2       1
 Signal Loss...   no       0       0   Excess Zeros...  no       0       0
   Blue (AIS)...  no       2       1     Idle (1100)... no       0       0
  Power Loss...   no       0       0     Xbit Alarm...  no       0       0
DS2 Frame Ls...  yes      60       2   DS2 Xbit Ala...  no       0       0

BIT      Total Errs......0    Error Secs......2

FBIT     Total Errs......0    Error Secs......0

PARITY   Total Errs......0    Error Secs......0

BPV      Total Errs......0    Error Secs......0

CBIT/P   Total Errs......2    %Error Free..98.33    Dribbling......0
         Error Secs......1    %Error Secs...1.67       Bursty......1
         Error Rate.5.07-7    Consec SES......0      Severely......0

                  DS1 Error Rate Test          ALARMS  CLEAR
-------------------------------------------------------------------
16:41:48 05/18  SA AT 9500 ATLANTA GA   Slot 2 RX2 DS1     Mode:   SF  AMI
END OF TEST RESULTS                     Timer: 00:01:00    Pattern: PRBS20
-------------------------------------------------------------------
STATUS      Current  Seconds  #Occur              Current  Seconds  #Occur
   Frame Loss...  no       0       0   Pattern Loss...  no       0       0
 Signal Loss...   no       0       0   Excess Zeros...  no       0       0
Yellow Alarm...   no       0       0       All Ones...  no       0       0
   Power Loss...  no       0       0   Data Channel... n/a

BIT      Total Errs......0    Error Secs......0

FBIT     Total Errs......0    Error Secs......0

BPV      Total Errs......0    Error Secs......0
```

The next section (A) tells you the:

- time and date of test
- location ID of your test set
- frame type
- receive input level

The pattern tells you whether the test was performed on live traffic or a test pattern. As you can see in this application, you were testing **PRBS 15** $2^{15}-1$ pattern.

The next section (B) gives you status results for all measured categories. Under Status, the printout provides the total number of seconds and the number of occurrences for each status category. For this test, we had a **BLUE** alarm which lasted a total of four seconds and occurred once.

The last section (C) of the printout lists each measured error type and the errors which occurred during the test. When errors do occur during a test, all selected error categories will be printed. If no errors occur during a test, the error category will be printed with total errors and error seconds values equal to zero. Printouts are shorter and easier to interpret when you do not print all categories.

You can easily command the AT 9500 to print out only those results you want to see using the RCVR Setup **page**. In this case, choose DS3 BERTS.

Move the ■ to **PRINT**. If there are any error types such as bit, BPV or parity which you do not want in the printed results, they can be turned OFF. To do so, move the ■ to **part** then to the desired error type and press **ENTER**. In this case, you have just turned off BPVs.

The AT 9500 will still measure and display BPV, but they will not be printed. To turn BPV ON, press **ENTER** again. The small ■ behind the flashing ■ indicates BPV printouts are enabled.

The AT 9500 will also allow you to select the condition which will cause the test set to print reports during a test. There are four selections which can be accessed from the Receiver Setup for DS3 and DS1 BERTS.

If you select DS3 BERTS, the first **page**, **Modes**, has a selection called Report. The four selections include:

- off
- errs/sec (errors per second)
- events
- results

When selecting **off**, the AT 9500 only prints a report when you force a printout from the front panel.

When selecting **results**, the test set prints a report at the beginning and end of a test and when an error or status change occurs. See the following sample Results printout.

Events is very similar to results. When you select **Events**, the AT 9500 will print a report at the beginning and end of a test. It will also print a report when a status change occurs. See the following sample Events printout.

When selecting **errs/sec**, the test set prints a report at the beginning and end of the test, plus a single line of error information for each second in which an error is detected. See the sample errs/sec printout.

In the **errs/sec** mode, the **Squelch** feature is inhibited.

Now you've seen how to:

- connect a printer to the AT 9500
- interpret the results of your tests
- print out exactly the results you want to see.

You should now be able to perform any of the tests in the Advanced Applications.

If you have any applications, sales or service questions about the AT 9500, call Scientific–Atlanta using this toll-free number: 1-800-541-4201.

```
                     DS3 Error Rate Test           ALARMS  CLEAR
------------------------------------------------------------------
16:42:39 12/22  SA AT 9500 ATLANTA GA   Slot 2 RX1 DS3      Mode:  M13  DSX
START TEST                              Timer: 00:00:01     Pattern: PRBS15
------------------------------------------------------------------


                     DS1 Error Rate Test           ALARMS  CLEAR
------------------------------------------------------------------
16:42:39 12/22  SA AT 9500 ATLANTA GA   Slot 2 RX2 DS1      Mode:   SF  AMI
START TEST                              Timer: 00:00:01     Pattern: PRBS20
------------------------------------------------------------------
```

Ⓐ

```
                     DS3 Error Rate Test           ALARMS  CLEAR
------------------------------------------------------------------
16:42:51 12/22  SA AT 9500 ATLANTA GA   Slot 2 RX1 DS3      Mode:  M13  DSX
PARTIAL RESULTS SUMMARY                 Timer: 00:00:13     Pattern: PRBS15
------------------------------------------------------------------

BIT     Total Errs......1   %Error Free..92.31   Dribbling......1
        Error Secs......1   %Error Secs...7.69      Bursty......0
        Error Rate.1.74-9    Consec SES......0    Severely......0

FBIT    Total Errs......1   %Error Free..92.31   Dribbling......1
        Error Secs......1   %Error Secs...7.69      Bursty......0
        Error Rate.2.92-7    Consec SES......0    Severely......0

BPV     Total Errs......1   %Error Free..92.31   Dribbling......1
        Error Secs......1   %Error Secs...7.69      Bursty......0
        Error Rate.1.72-9    Consec SES......0    Severely......0

                     DS1 Error Rate Test           ALARMS  CLEAR
------------------------------------------------------------------
16:42:51 12/22  SA AT 9500 ATLANTA GA   Slot 2 RX2 DS1      Mode:   SF  AMI
PARTIAL RESULTS SUMMARY                 Timer: 00:00:13     Pattern: PRBS20
------------------------------------------------------------------

BIT     Total Errs......1   %Error Free..92.86   Dribbling......1
        Error Secs......1   %Error Secs...7.14      Bursty......0
        Error Rate.5.01-8    Consec SES......0    Severely......0

FBIT    Total Errs......1   %Error Free..92.86   Dribbling......1
        Error Secs......1   %Error Secs...7.14      Bursty......0
        Error Rate.9.62-6    Consec SES......0    Severely......0

BPV     Total Errs......1   %Error Free..93.33   Dribbling......1
        Error Secs......1   %Error Secs...6.67      Bursty......0
        Error Rate.4.98-8    Consec SES......0    Severely......0
```

Ⓑ

```
16:43:02 2-RX1 DS3 Begin LOS,OOF,LOP

16:43:11 2-RX1 DS3 End LOS, Secs=9
16:43:11 2-RX1 DS3 End OOF, Secs=9
16:43:11 2-RX1 DS3 End LOP, Secs=9

[illegible] 2-RX2 DS1 Begin LOS,OOF,LOP

16:43:17 2-RX2 DS1 End LOS, Secs=4
16:43:17 2-RX2 DS1 End OOF, Secs=4
```

Ⓒ

Ⓐ The DS3 and DS1 report at the test start.

Ⓑ The Results Report Summary when the AT 9500 detects an error.

Ⓒ Timed reports of Status changes.

Sample Output – Report Results

```
16:43:24 2-RX1 DS3 Begin OOF,LOF

16:43:25 2-RX1 DS3 End LOF, Secs=1

16:43:28 2-RX1 DS3 Begin LOF

16:43:29 2-RX1 DS3 End OOF, Secs=5
16:43:29 2-RX1 DS3 End LOF, Secs=1

16:43:32 2-RX1 DS3 Begin LOF

16:43:33 2-RX1 DS3 End LOF, Secs=1

16:43:35 2-RX1 DS3 Begin LOF
16:43:35 2-RX1 DS3 Begin Blue

16:43:39 2-RX1 DS3 End Blue, Secs=4

16:43:45 2-RX1 DS3 End LOF, Secs=10

16:43:46 2-RX1 DS3 Begin LOF
16:43:46 2-RX1 DS3 Begin Blue
```

Ⓒ

```
                          DS3 Error Rate Test           ALARMS    LOF
-----------------------------------------------------------------------------
16:43:46 12/22  SA AT 9500 ATLANTA GA   Slot 2 RX1 DS3        Mode:  M13  DSX
PARTIAL RESULTS SUMMARY                 Timer: 00:01:08       Pattern:   BLUE
-----------------------------------------------------------------------------

CBIT/P Total Errs......2   %Error Free..77.94     Dribbling......0
       Error Secs.....15   %Error Secs..22.06        Bursty......1
       Error Rate.5.63-7    Consec SES......2      Severely.....14

16:43:50 2-RX1 DS3 Begin Idle

16:43:51 2-RX1 DS3 End Blue, Secs=5


                          DS3 Error Rate Test           ALARMS    LOF
-----------------------------------------------------------------------------
16:43:54 12/22  SA AT 9500 ATLANTA GA   Slot 2 RX1 DS3        Mode:  M13  DSX
PARTIAL RESULTS SUMMARY                 Timer: 00:01:16       Pattern: PRBS15
-----------------------------------------------------------------------------

CBIT/P Total Errs......4   %Error Free..78.95     Dribbling......0
       Error Secs.....16   %Error Secs..21.05        Bursty......2
       Error Rate.9.81-7    Consec SES......2      Severely.....14
```

Ⓓ

```
16:43:55 2-RX1 DS3 End LOF, Secs=9
16:43:55 2-RX1 DS3 End Idle, Secs=5

16:44:10 2-RX2 DS1 Begin LOF
16:44:10 2-RX2 DS1 Begin Yellow
16:44:10 2-RX2 DS1 Excess Zeros

16:44:11 2-RX2 DS1 Excess Zeros

16:44:12 2-RX2 DS1 Excess Zeros

16:44:13 2-RX2 DS1 Excess Zeros

16:44:14 2-RX2 DS1 Excess Zeros
```

Ⓔ

Ⓒ Timed reports of Status changes.

Ⓓ A partial Results Report due to C–bit parity errors.

Ⓔ Timed Status Reports.

Sample Output – Report Results (continued)

```
16:44:16 2-RX2 DS1 End LOP, Secs=6
16:44:16 2-RX2 DS1 End Yellow, Secs=6


                           DS3 Error Rate Test           ALARMS    LOS HIST
-------------------------------------------------------------------------------
16:44:58 12/22  SA AT 9500 ATLANTA GA   Slot 2 RX1 DS3         Mode:  M13  DSX
END OF TEST SUMMARY                     Timer: 00:02:20        Pattern: PRBS15
-------------------------------------------------------------------------------
STATUS       Current  Seconds  #Occur                  Current  Seconds  #Occur
  Frame Loss...  no       14       2   Pattern Loss...  no       31       6
 Signal Loss...  no        9       1   Excess Zeros...  no        0       0
  Blue (AIS)...  no        9       2     Idle (1100)...  no        5       1
  Power Loss...  no        0       0      Xbit Alarm...  no        0       0
DS2 Frame Ls... yes      140       1   DS2 Xbit Alm...  no        0       0

BIT     Total Errs......1   %Error Free..77.14     Dribbling......1
        Error Secs.....32   %Error Secs..22.86        Bursty......0
        Error Rate.2.1-10    Consec SES......3      Severely.....31

FBIT    Total Errs......1   %Error Free..89.29     Dribbling......1
        Error Secs.....15   %Error Secs..10.71        Bursty......0
        Error Rate.3.02-8    Consec SES......2      Severely.....14

PARITY  Total Errs......0    Error Secs.....14

BPV     Total Errs......1   %Error Free..92.86     Dribbling..... 1
        Error Secs.....10   %Error Secs...7.14        Bursty......0
        Error Rate.1.7-10    Consec SES......1      Severely......9

CBIT/P  Total Errs......4   %Error Free..88.57     Dribbling......0
        Error Secs.....16   %Error Secs..11.43        Bursty......2
        Error Rate.4.83-7    Consec SES......2      Severely.....14


                           DS1 Error Rate Test           ALARMS    LOS HIST
-------------------------------------------------------------------------------
16:44:58 12/22  SA AT 9500 ATLANTA GA   Slot 2 RX2 DS1         Mode:   SF  AMI
END OF TEST SUMMARY                     Timer: 00:02:20        Pattern: PRBS20
-------------------------------------------------------------------------------
STATUS       Current  Seconds  #Occur                  Current  Seconds  #Occur
  Frame Loss...  no        4       1   Pattern Loss...  no       10       2
 Signal Loss...  no        4       1   Excess Zeros...  no        5      15
Yellow Alarm...  no        6       1       All Ones...  no        0       0
  Power Loss...  no        0       0

BIT     Total Errs......1   %Error Free..92.14     Dribbling..... 1
        Error Secs.....11   %Error Secs...7.86        Bursty......0
        Error Rate.5.01-9    Consec SES......2      Severely.....10

FBIT    Total Errs......1   %Error Free..96.43     Dribbling......1
        Error Secs......5   %Error Secs...3.57        Bursty......0
        Error Rate.9.19-7    Consec SES......1      Severely......4

BPV     Total Errs......1   %Error Free..96.43     Dribbling......1
        Error Secs......5   %Error Secs...3.57        Bursty......0
        Error Rate.4.76-9    Consec SES......1      Severely......4
```

Ⓕ

Ⓕ The final Results Report for a test.

Sample Output – Report Results (concluded)

```
                        DS3 Error Rate Test          ALARMS  CLEAR
-----------------------------------------------------------------------------
16:39:55 12/22  SA AT 9500 ATLANTA GA   Slot 2 RX1 DS3        Mode:  M13  DSX
START TEST                              Timer: 00:00:01       Pattern: PRBS15
-----------------------------------------------------------------------------


                        DS1 Error Rate Test          ALARMS  CLEAR
-----------------------------------------------------------------------------
16:39:55 12/22  SA AT 9500 ATLANTA GA   Slot 2 RX2 DS1        Mode:   SF  AMI
START TEST                              Timer: 00:00:01       Pattern: PRBS20
-----------------------------------------------------------------------------
```

Ⓐ

```
16:40:15 2-RX2 DS1 Begin LOS,OOF,LOP

16:40:18 2-RX1 DS3 Begin LOS,OOF,LOP

16:40:19 2-RX2 DS1 End LOS, Secs=4
16:40:19 2-RX2 DS1 End OOF, Secs=4
16:40:19 2-RX2 DS1 End LOP, Secs=4

16:40:24 2-RX1 DS3 End LOS, Secs=6
16:40:24 2-RX1 DS3 End OOF, Secs=6
16:40:24 2-RX1 DS3 End LOP, Secs=6

16:40:30 2-RX2 DS1 Begin LOP
16:40:30 2-RX2 DS1 Begin Yellow
16:40:30 2-RX2 DS1 Excess Zeros

16:40:31 2-RX2 DS1 Excess Zeros

16:40:32 2-RX2 DS1 Excess Zeros

16:40:33 2-RX2 DS1 Excess Zeros

16:40:34 2-RX2 DS1 Excess Zeros

16:40:35 2-RX2 DS1 Excess Zeros

16:40:36 2-RX2 DS1 Excess Zeros

16:40:37 2-RX2 DS1 Excess Zeros

16:40:38 2-RX2 DS1 End LOP, Secs=8
16:40:38 2-RX2 DS1 End Yellow, Secs=8

16:40:45 2-RX2 DS1 Begin LOP
16:40:45 2-RX2 DS1 Begin All Ones

16:40:51 2-RX2 DS1 End LOP, Secs=6
16:40:51 2-RX2 DS1 End All Ones, Secs=6

16:41:00 2-RX1 DS3 Begin LOP
16:41:00 2-RX1 DS3 Begin Blue

16:41:05 2-RX1 DS3 Begin Idle

16:41:06 2-RX1 DS3 End Blue, Secs=6

16:41:13 2-RX1 DS3 End LOP, Secs=13
16:41:13 2-RX1 DS3 End Idle, Secs=8
```

Ⓑ

Ⓐ The Events Report at the start of the test.

Ⓑ The Events Reports at Status changes.

Sample Output – Report Events

```
16:41:19 2-RX1 DS3 End LOP, Secs=1

16:41:27 2-RX1 DS3 Begin Xbit Alarm

16:41:36 2-RX1 DS3 End Xbit Alarm, Secs=9


                      DS3 Error Rate Test            ALARMS     LOS HIST
-----------------------------------------------------------------------------
16:41:41 12/22  SA AT 9500 ATLANTA GA   Slot 2 RX1 DS3       Mode:  M13  DSX
END OF TEST SUMMARY                     Timer: 00:01:47      Pattern: PRBS15
-----------------------------------------------------------------------------
STATUS        Current  Seconds  #Occur               Current  Seconds  #Occur
  Frame Loss...  no       6        1     Pattern Loss...  no      20        3
 Signal Loss...  no       6        1     Excess Zeros...  no       0        0
  Blue (AIS)...  no       6        1       Idle (1100)...  no       8        1
  Power Loss...  no       0        0        Xbit Alarm...  no       9        1
DS2 Frame Ls... yes     107        1     DS2 Xbit Alm...  no       0        0

BIT     Total Errs......2   %Error Free..79.44     Dribbling......2
        Error Secs.....22   %Error Secs..20.56        Bursty......0
        Error Rate.5.2-10    Consec SES......2      Severely......0

FBIT    Total Errs......2   %Error Free..92.52     Dribbling......2
        Error Secs......8   %Error Secs...7.48        Bursty......0
        Error Rate.7.52-8    Consec SES......1      Severely......6

PARITY  Total Errs......0    Error Secs......6

BPV     Total Errs......2   %Error Free..92.52     Dribbling......2
        Error Secs......8   %Error Secs...7.48        Bursty......0
        Error Rate.4.4-10    Consec SES......1      Severely......6

CBIT/P  Total Errs......2   %Error Free..92.52     Dribbling......2
        Error Secs......8   %Error Secs...7.48        Bursty......0
        Error Rate.3.01-7    Consec SES......1      Severely......6


                      DS1 Error Rate Test            ALARMS     LOS HIST
-----------------------------------------------------------------------------
16:41:41 12/22  SA AT 9500 ATLANTA GA   Slot 2 RX2 DS1       Mode:    SF   AMI
END OF TEST SUMMARY                     Timer: 00:01:47      Pattern: PRBS20
-----------------------------------------------------------------------------
STATUS        Current  Seconds  #Occur               Current  Seconds  #Occur
  Frame Loss...  no       4        1     Pattern Loss...  no      18        3
 Signal Loss...  no       4        1     Excess Zeros...  no       8       24
Yellow Alarm...  no       8        1         All Ones...  no       8        1
  Power Loss...  no       0        0

BIT     Total Errs......2   %Error Free..81.31     Dribbling......2
        Error Secs.....20   %Error Secs..18.69        Bursty......0
        Error Rate.1.46-8    Consec SES......3      Severely.....18

FBIT    Total Errs......2   %Error Free..94.39     Dribbling......2
        Error Secs......6   %Error Secs...5.61        Bursty......0
        Error Rate.2.43-6    Consec SES......1      Severely......4

BPV     Total Errs......2   %Error Free..94.39     Dribbling......2
        Error Secs......6   %Error Secs...5.61        Bursty......0
        Error Rate.1.26-8    Consec SES......1      Severely...... 4
```

Ⓒ

Ⓒ A final Events Report for a test.

Sample Output – Report Events (concluded)

```
                              DS3 Error Rate Test          ALARMS   CLEAR
---------------------------------------------------------------------------
16:36:07 12/22  SA AT 9500 ATLANTA GA   Slot 2 RX1 DS3      Mode:  M13  DSX
START TEST                              Timer: 00:00:01     Pattern: PRBS15
---------------------------------------------------------------------------


                              DS1 Error Rate Test          ALARMS   CLEAR
---------------------------------------------------------------------------
16:36:07 12/22  SA AT 9500 ATLANTA GA   Slot 2 RX2 DS1      Mode:   SF  AMI
START TEST                              Timer: 00:00:01     Pattern: PRBS20
---------------------------------------------------------------------------

16:36:17 2-RX2 DS1 Begin LOS,OOF,LOP

16:36:19 2-RX2 DS1 End LOS, Secs=2
16:36:19 2-RX2 DS1 End OOF, Secs=2
16:36:19 2-RX2 DS1 End LOP, Secs=2

16:36:22 2-RX1 DS3 Begin LOS,OOF,LOP

16:36:26 2-RX1 DS3 End LOS, Secs=4
16:36:26 2-RX1 DS3 End OOF, Secs=4
16:36:26 2-RX1 DS3 End LOP, Secs=4

16:36:52 2-RX1 DS3 Bit=1, 2.26-8
16:36:52 2-RX2 DS1 Bit=1, 6.51-7
16:36:59 2-RX1 DS3 Bit=1, 2.26-8
16:36:59 2-RX2 DS1 Bit=1, 6.51-7
16:37:09 2-RX1 DS3 Bit=1, 2.26-8
16:37:09 2-RX2 DS1 Bit=1, 6.52-7
16:37:21 2-RX1 DS3 Bit=1, 2.26-8
16:37:32 2-RX2 DS1 Bit=1, 6.52-7
16:37:46 2-RX1 DS3 Begin Xbit Alarm

16:37:58 2-RX1 DS3 End Xbit Alarm, Secs=10

16:38:08 2-RX1 DS3 Begin LOP
16:38:08 2-RX1 DS3 Begin Blue

16:38:08 2-RX1 DS3 C/p=2, 3.04-5
16:38:17 2-RX1 DS3 C/p=2, 3.04-5
16:38:18 2-RX1 DS3 End LOP, Secs=10
16:38:18 2-RX1 DS3 End Blue, Secs=10

16:38:29 2-RX2 DS1 Begin LOP

16:38:30 2-RX2 DS1 Begin Yellow
16:38:30 2-RX2 DS1 Excess Zeros

16:38:31 2-RX2 DS1 Excess Zeros

16:38:32 2-RX2 DS1 Excess Zeros

16:38:33 2-RX2 DS1 Excess Zeros

16:38:34 2-RX2 DS1 Excess Zeros

16:38:35 2-RX2 DS1 Excess Zeros

16:38:36 2-RX2 DS1 Excess Zeros
```

Ⓐ The DS3 and DS1 err/secs report at test start.

Ⓑ The timed err/secs reports of Status changes and detected errors.

Sample Output – Report errs/sec

```
16:38:38 2-RX2 DS1 End LOF, Secs=9
16:38:38 2-RX2 DS1 End Yellow, Secs=8

16:38:49 2-RX2 DS1 Begin LOF
16:38:49 2-RX2 DS1 Begin All Ones

16:38:57 2-RX2 DS1 End LOF, Secs=8
16:38:57 2-RX2 DS1 End All Ones, Secs=8

                          DS3 Error Rate Test           ALARMS    LOS HIST
----------------------------------------------------------------------------
16:39:03 12/22  SA AT 9500 ATLANTA GA   Slot 2 RX1 DS3       Mode:  M13  DSX
END OF TEST SUMMARY                     Timer: 00:02:57      Pattern: PRBS15
----------------------------------------------------------------------------
STATUS       Current  Seconds  #Occur             Current  Seconds  #Occur
  Frame Loss...  no       4       1    Pattern Loss...  no       14       2
 Signal Loss...  no       4       1    Excess Zeros...  no        0       0
  Blue (AIS)...  no      10       1     Idle (1100)...  no        0       0
  Power Loss...  no       0       0      Xbit Alarm...  no       19       1
DS2 Frame Ls... yes     177       1    DS2 Xbit Alm...  no        0       0

BIT     Total Errs......4   %Error Free..89.83    Dribbling......4
        Error Secs.....18   %Error Secs..10.17       Bursty......0
        Error Rate.5.6-10    Consec SES......2     Severely.....14

FBIT    Total Errs......4   %Error Free..95.48    Dribbling......4
        Error Secs......8   %Error Secs...4.52       Bursty......0
        Error Rate.8.79-8    Consec SES......1     Severely......4

PARITY Total Errs......0     Error Secs......4

BPV     Total Errs......4   %Error Free..95.48    Dribbling......4
        Error Secs......8   %Error Secs...4.52       Bursty......0
        Error Rate.5.2-10    Consec SES......1     Severely......4

CBIT/P Total Errs......4    %Error Free..96.61    Dribbling......0
        Error Secs......6   %Error Secs...3.39       Bursty......2
        Error Rate.3.51-7    Consec SES......1     Severely......4

                          DS1 Error Rate Test           ALARMS    LOS HIST
----------------------------------------------------------------------------
16:39:03 12/22  SA AT 9500 ATLANTA GA   Slot 2 RX2 DS1       Mode:    SF   AMI
END OF TEST SUMMARY                     Timer: 00:02:57      Pattern: PRBS20
----------------------------------------------------------------------------
STATUS       Current  Seconds  #Occur             Current  Seconds  #Occur
  Frame Loss...  no       2       1    Pattern Loss...  no       19       3
 Signal Loss...  no       2       1    Excess Zeros...  no        8      26
Yellow Alarm...  no       8       1        All Ones...  no        9       1
  Power Loss...  no       0       0

BIT     Total Errs......4   %Error Free..87.01    Dribbling......4
        Error Secs.....23   %Error Secs..12.99       Bursty......0
        Error Rate.1.65-8    Consec SES......2     Severely.....19

FBIT    Total Errs......4   %Error Free..96.61    Dribbling......4
        Error Secs......6   %Error Secs...3.39       Bursty......0
        Error Rate.2.86-6    Consec SES......0     Severely......2

[illegible] Total Errs......4   %Error Free..96.61    Dribbling......[illegible]
        Error Secs......6   %Error Secs...3.39       Bursty......[illegible]
        Error Rate.1.48-8    Consec SES......0     Severely......2
```

(C)

(C) An errs/sec report at the end of the test.

Sample Output – Report errs/sec (concluded)

ADVANCED APPLICATIONS
TESTING WITH THE AT 9500

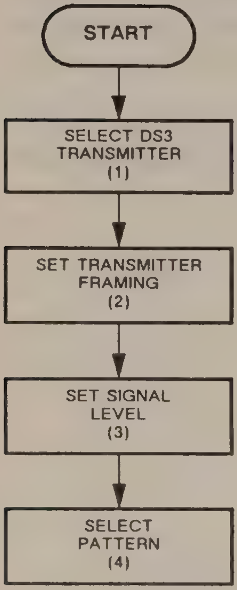
The AT 9500 performs eight types of Out-of-Service and In-Service tests on digital networks. The test procedures describe the normal methods of setting-up the tests and interpreting the results. The test procedures in the following sections are presented in a sequence to perform a network evaluation.

The page descriptions in the Front Panel Operation Section describe other checks which can be made with the AT 9500. The test set prevents you from selecting invalid measurements by locking out the invalid selection.

CONVENTIONS

These test procedures were carefully arranged to help you quickly do the tests. On the left side is a Flow Chart with a brief description of a procedural step. If you need more information about the step, simply refer to the detailed step description on the opposite side.

SETUP DS3 TRANSMITTER FUNCTION



Front Panel Operation	Computer Operation
1. Select **Setup XMTR** key to set up the transmitter. Move the ■ to DS3. Press **ENTER**. Result – The **XMTR** LED lights. The LCD shows the DS3 BERTS XMTR SETUP page.	1. Address the DS3 transmitter function: (enter ADDR DS3–TX).
2. Set transmitter framing for the network frame type (select **m13**). Result – a ■ is next to **m13**.	2. Set the test set transmitter framing for the network frame type: (example enter FRAME M13).
3. Set signal level (example select **dsx**). Result – a ■ is next to **dsx**. DSX OVERRIDE message indicates you should check **Level** switch setting.	3. Set signal level: (example enter LEVEL DSX).
4. Select pattern type (example select **prbs**, example **15**). Result – a ■ is next to **prbs** and **15**.	4. Set pattern type: (example enter PRBS–15).

The detailed step descriptions are in a convenient two column format. The left column is for Front Panel operation, and the right column is for Controller operation of the test set. If a test step is necessary for one type of operation but not the other, the column is left blank.

Each step describes an action for you to perform. Following the action is the Result you should see on the test set. There are few visible results in Controller operation of the test set. However, if you enable ECHO–mode, the terminal will display each character the AT 9500 receives.

If the action in a step depends on your network, the step reads:

- Example: SF (for front panel operation) or
- Example: enter CLOCK INT (for controller operation)

If the action does not depend on the network application, the step reads:

- select Modes (for front panel operation)
- enter ADDR DS3–RX (for controller operation).

OUT-OF SERVICE TESTS

There are two basic approaches to measuring errors:

- out-of-service testing – requires the removal of live traffic from the system and a test pattern, which simulates line traffic, be applied to the system. Errors are measured on the simulated payload.
- in-service testing – allows traffic bearing circuits to be tested, but the only patterns which can be monitored are the overhead bits, since the test equipment cannot predict the payload bits.

Usually out-of-service testing is performed when a system is installed and commissioned. Once a circuit is carrying traffic, out-of-service testing is a last resort when serious problems are reported on the network.

You perform out-of-service testing by connecting the Bit Error Rate Transmitter to the appropriate cross-connect panel. The transmitter should be set up to send a test pattern (PRBS) which simulates live traffic or stresses the system in some other way. You can test the system end-to-end if a receiver is at the far end of the transmission path. Otherwise, a loop-back test can be performed. In a loop-back test, the far-end receiver is looped back to the transmit end. In this case, the receiver and transmitter are collocated.

When errors are detected in a loop-back test it is impossible to tell if the errors are in the transmit direction or the return direction. When loop-back errors are detected, it is necessary to perform end-to-end error measurements.

The primary advantage of an out-of-service test is that errors can be measured on the payload bits. This is possible because the Bit Error Rate Receiver is capable of generating the same test patterns as the Bit Error Rate Transmitter. Therefore, the receiver can synchronize with the incoming test pattern and perform a bit-by-bit comparison.

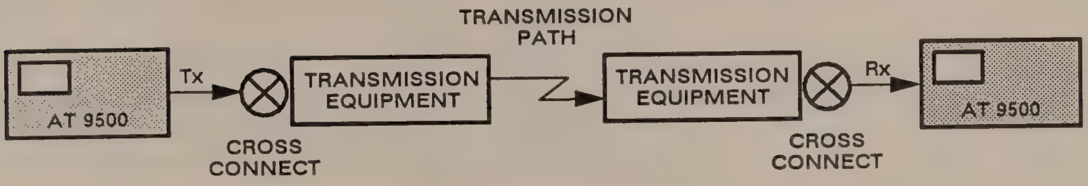
DS3 NETWORK TEST

A DS3 Network Test is an out-of-service test that can check the operational status of a digital network. Use this test to identify the possible sources of the problem. Prior to this test you should:

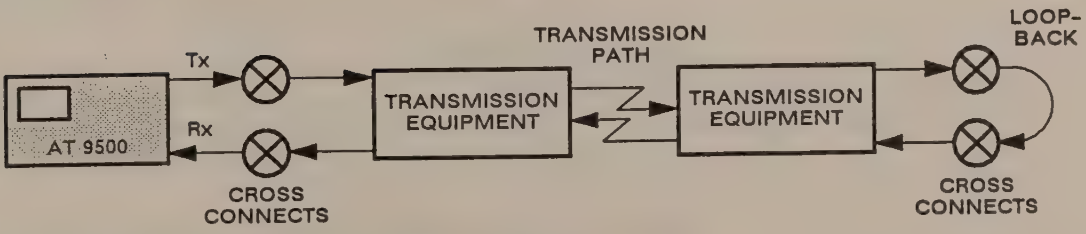
- Read the first three Chapters and Basic Applications.
- Watch the training video.
- Get the necessary cables to connect to the network. See the following figures since this is an out-of-service test.
- Decide between front panel or computer operation of the test.

During the DS3 Network Test you will do the following:

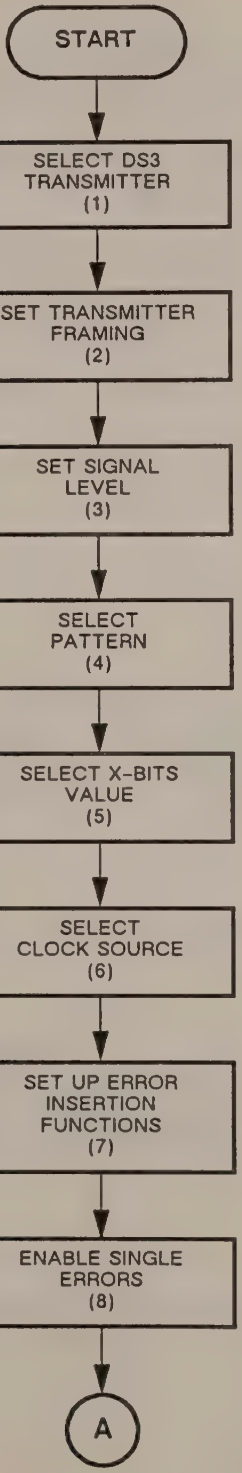
- Set up the DS3 transmitter
- Set up the DS3 receiver
- Run the test
- Examine the results



Out-of-Service End-to-End Error Rate Test

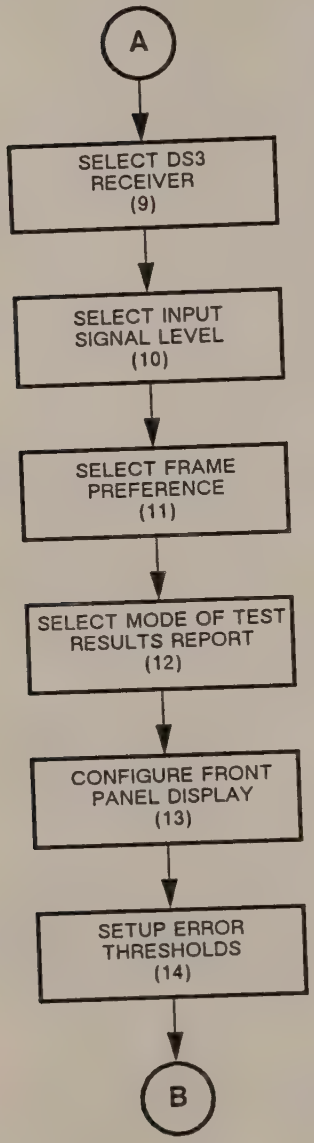


Out-of-Service Loopback Error Rate Test


START
SELECT DS3 TRANSMITTER (1)
SET TRANSMITTER FRAMING (2)
SET SIGNAL LEVEL (3)
SELECT PATTERN (4)
SELECT X-BITS VALUE (5)
SELECT CLOCK SOURCE (6)
SET UP ERROR INSERTION FUNCTIONS (7)
ENABLE SINGLE ERRORS (8)
A

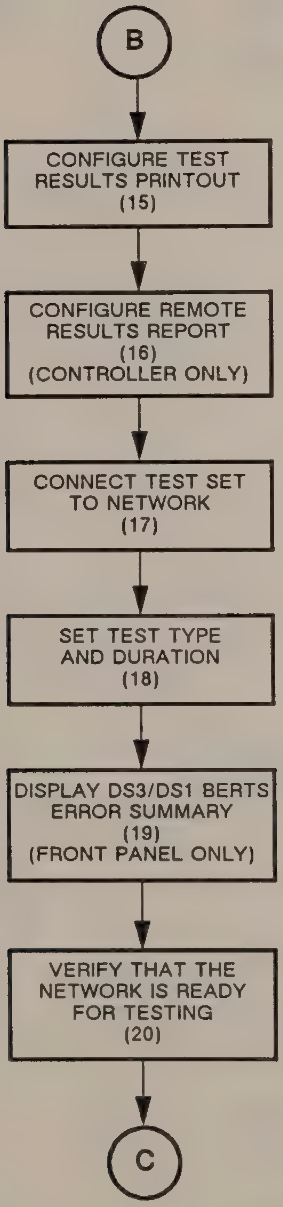
SETUP DS3 TRANSMITTER FUNCTION

Front Panel Operation	**Controller Operation**
1. Select **Setup XMTR** key to set up the transmitter. Move the ■ to DS3. Press **ENTER**. Result – The **XMTR** LED lights. The LCD shows the DS3 BERTS XMTR SETUP **page**.	1. Address the DS3 transmitter function: (enter ADDR DS3–TX).
2. Set transmitter framing for the network frame type (example: **m13**). Result – a ■ is next to **m13**.	2. Set the test set transmitter framing for the network frame type: (example: enter FRAME M13).
3. Set signal level (example: **dsx**). Result – a ■ is next to **dsx**. DSX OVERRIDE message indicates you should check **Level** switch setting.	3. Set signal level: (example: enter LEVEL DSX).
4. Select pattern type (example: **prbs**, example: **15**). Result – a ■ is next to **prbs** and **15**.	4. Set pattern type: (example: enter PATTERN PRBS–15).
5. Select the value for X–bits. Move ■ to **Miscellaneous** field then to **Xbit** field (example: **1**). Result – a ■ is next to **1**.	5. Set value for X–bits: (example: enter XBIT 1).
6. Select the clock source for the output signal. Move ■ to the **Clock** field and make choice (example: **internal**). Result – a ■ is next to **internal**.	6. Select clock source for output signal: (example: enter CLOCK INT).
7. Set up Error Insertion functions. Move the ■ to **Errors** field, then to **Insert** field (example: **single**). Result – a ■ is next to **single**.	7. Error Insertion functions are setup and enabled at the same time, so no initial setup is necessary.
8. Enable single errors for insertion with the **ERR INS** key (example: for **Pattern** select **bit**, **Frame** choose **fbit**, and **Coding** choose **off**). Result – a ■ is next to **bit**, **fbit** and **off**.	


A
SELECT DS3 RECEIVER (9)
SELECT INPUT SIGNAL LEVEL (10)
SELECT FRAME PREFERENCE (11)
SELECT MODE OF TEST RESULTS REPORT (12)
CONFIGURE FRONT PANEL DISPLAY (13)
SETUP ERROR THRESHOLDS (14)
B

SETUP DS3 RECEIVER FUNCTION

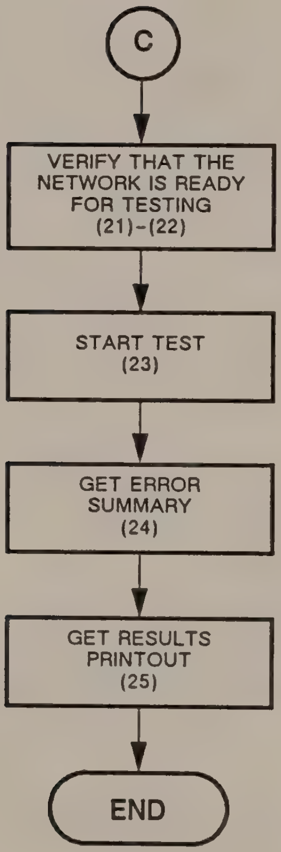
Front Panel Operation	Controller Operation
9. Press **RCVR/THRU** key to set up the receiver. Move ■ to select **DS3 BERTS** and press **ENTER**. Result – The LCD shows the DS3 BERTS RCVR SETUP **page**.	9. Address DS3 receiver function: (enter ADDR DS3–RX).
10. Select input signal level. Move ■ to **Level** fields (example: **dsx/low**). Result – a ■ is next to **dsx/low**.	10. Select input signal level: (example: enter LEVEL DSX).
11. Select **Frame preference** for auto framing algorithm. Move ■ to the **Frame preference** fields (example: **m13**). Result – a ■ is next to **m13**.	11. Select frame preference for auto framing algorithm: (example: enter PREF M13).
12. Select the mode of the test results report. Move ■ to **Report** fields (example: **events**). Result – a ■ is next to **events**.	12. Select mode of the test results Report: (example: enter REPORT PRINTER EVENTS).
13. Set up Front Panel display. Move the ■ to **Display** field, then to the **Display error results** field (example: enter **all**). Result – a ■ is next to **all**.	13. Set up Front Panel display: (example: enter SET–DISPLAY ALL).
14. Set up the error thresholds. Move ■ to the **Thresh** field, then to **Program** field to set the three thresholds for each error type. To set the thresholds: • move the ■ to error type **Program** (example: **bit**) • move the ■ to **Dribbling** • press ▶ to move the ■ to the threshold value field • Use the ◀/▶ keys to get to digits • Use the ▲/▼ keys to set each digit • Press **ENTER** to set the value. Repeat this procedure for the **Bursty** and **Severely** threshold values and for each error type Program (**fbit** and **parity**). Result – the screen shows the error thresholds.	14. Set up the error thresholds. Start with the bit error thresholds: (example: enter THRES–B 1,2,45). Then set the F–bit error thresholds: (example: enter THRES–F 1,2,45). Finally, set the parity error thresholds: (example: enter THRES–P 1,2,45).


B
CONFIGURE TEST RESULTS PRINTOUT (15)
CONFIGURE REMOTE RESULTS REPORT (16) (CONTROLLER ONLY)
CONNECT TEST SET TO NETWORK (17)
SET TEST TYPE AND DURATION (18)
DISPLAY DS3/DS1 BERTS ERROR SUMMARY (19) (FRONT PANEL ONLY)
VERIFY THAT THE NETWORK IS READY FOR TESTING (20)
C

Front Panel Operation	Controller Operation
15. Set up Test Results printout (optional). Move ■ to **Print** field, then to **Printout** test results field (example: **all**). Result – a ■ is next to **all**.	15. Set up the Test Results Printout (optional). Select the RS-232 port for printer output: (example: enter PRINT-DEV COM2). Select Results printout format: (example: enter SET-RESULTS ALL).
	16. Set up Remote Results Report. Select mode for Remote Results: (example: enter REPORT REMOTE EVENTS).

START THE NETWORK TEST

17. Connect AT 9500 to the network. Connect a cable between **DS3 TX1** and the network. Connect a return cable between the network and **DS3 RX** input.	17. Connect AT 9500 to the network. Connect a cable between **DS3 TX1** and the network. Connect a return cable between the network and **DS3 RX** input.
18. Set test type and duration by pressing **Test TIME**. - Move ■ to select test type (example: **single**) - Move ■ to **Duration** field - press ▶ to enter the **Duration** value field - Use the ◀/▶ keys to access each digit - Use the ▲/▼ keys to set each digit - Press **ENTER** to set the value. Result – The **page Duration** field shows the test duration.	18. Set the test type and duration (example: enter TEST-TYPE SINGLE and enter TIMER xx:yy:zz where: xx = hours yy = minutes zz = seconds
Optional – Use ■ and **ENTER** to set current date and time on the **page**.	Optional – Enter current date and time. (enter TIME xx:yy:zz), (enter DATE aa/bb) where: aa = month bb = day
19. Press **SUMMARY** in the **Results** section of the front panel. Result – The LCD changes to show a DS3/DS1 BERTS error summary **page**.	
20. Verify the network is ready for testing. First, look at the **Status DS3** LEDs. Result – all red LEDs under **DS3** should be OFF.	20. Verify network is ready to test. First, check Receiver Status: (example: enter STATUS). Status report should show: Pattern Loss = no Frame Loss = no Signal Loss = no


C
VERIFY THAT THE NETWORK IS READY FOR TESTING (21)-(22)
START TEST (23)
GET ERROR SUMMARY (24)
GET RESULTS PRINTOUT (25)
END

Front Panel Operation	Computer Operation
21. Next press **RUN/STOP** key to start a trial test. Insert a single bit and F-bit error by pressing the **SHIFT** plus **ERR INS** keys. Result – a single es (error second) should appear in the **bit es** and **fbit es** display field.	21. Next start a trial test: (enter RUN). Insert a single bit and F-bit error: (example: enter ERRORS DS3-TX BIT FBIT). Then check to verify errors passed through the network: (enter STOP), (enter SUMMARY DS3-RX)
22. Stop the trial test. Press **RUN/ STOP** key to end the trial. If any red **Status DS3 LEDs** are ON and the screen does not show the bit es – • check the cable connections between AT 9500 and the network • check test set up • check the network for improper configuration.	22. The Summary report should verify that a bit error second and an F-bit error second have been detected. If you get an LOS, OOF, or LOP indication or if the single error was not on the Summary report – • check the cable connections between AT 9500 and the network • check the test set up • check the network for improper configuration.
23. Once the network configuration is established, start the test by pressing the **RUN** key.	23. Once the network configuration is established, start the test: (enter RUN).

EXAMINE THE NETWORK TEST RESULTS

24. At the end of the test, the screen shows the error seconds Summary of the completed test. You can find other error measurements by scrolling through the pages under the **DS3/DS1 Measurements** key. Press the **DS3/DS1** key until the DS3 LED lights, and then use the ▲/▼ keys to get DS3 measurements.	24. At both the start and finish of the test, the AT 9500 provides a Results report printout to the remote controller user. A change in the operating status (LOS, OOF, PAT LOSS, BLUE, etc.) during the test also causes a Results report to be generated. (enter STOP).
25. At any time, you can get a results printout by the pressing the **SHIFT** plus **PRINT** key.	25. At any time, you can initiate a report output on the printer port: (enter PRINT DS3-RX).

DS3 STRESS TEST

A DS3 Stress Test is an out-of-service test that checks the payload and overhead bit operation of a digital network. In a DS3 Stress Test you inject errors into the AT 9500 transmitter output, then insert the errors into the digital network. Use the AT 9500 receiver to analyze the return signals. Prior to this test you should:

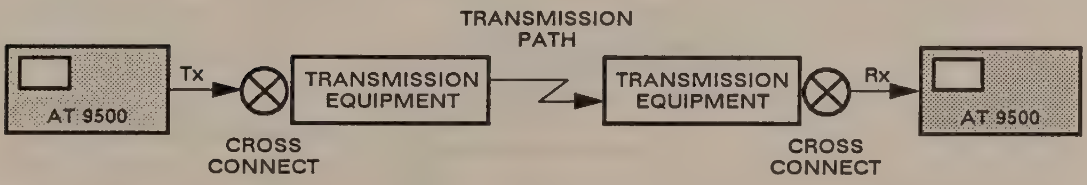
- Read the first three Chapters and Basic Applications.
- Watch the training video.
- Get the necessary cables to connect to the network. See the following figures since this is an out-of-service test.
- Decide between front panel or controller operation of the test.
- Review the Conventions described at the beginning of Advanced Applications.

During the DS3 Stress Test you will:

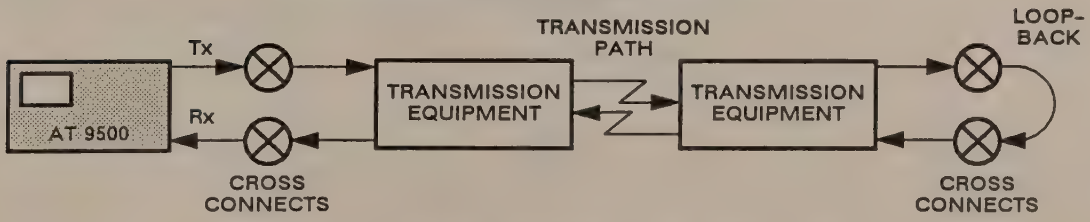
- Set up the DS3 transmitter.
- Set up the DS3 receiver.
- Validate the network configuration.
- Run the test.
- Examine the results.

NOTE

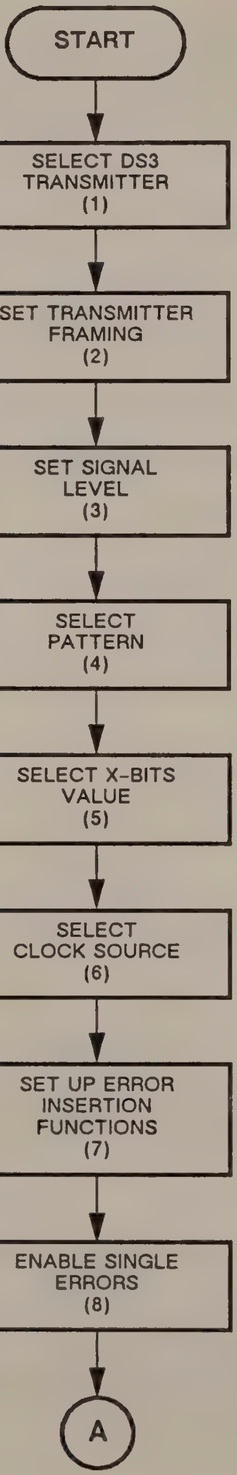
Be sure the AT 9500 is in STOP-mode before you start a test.



Out-of-Service End-to-End Error Rate Test

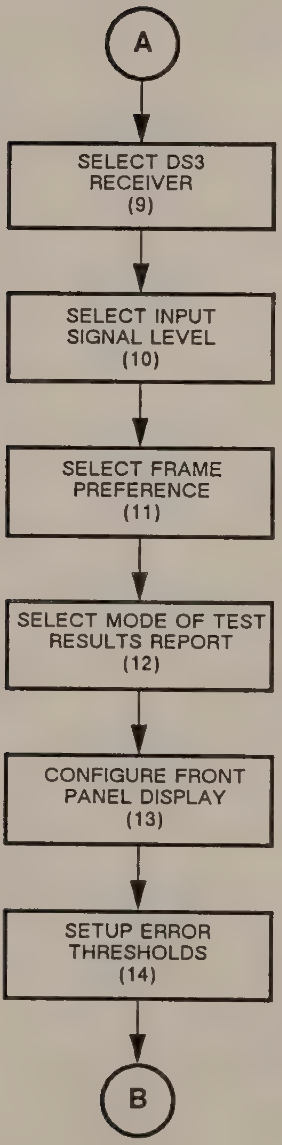


Out-of-Service Loopback Error Rate Test


START
SELECT DS3 TRANSMITTER (1)
SET TRANSMITTER FRAMING (2)
SET SIGNAL LEVEL (3)
SELECT PATTERN (4)
SELECT X-BITS VALUE (5)
SELECT CLOCK SOURCE (6)
SET UP ERROR INSERTION FUNCTIONS (7)
ENABLE SINGLE ERRORS (8)
A

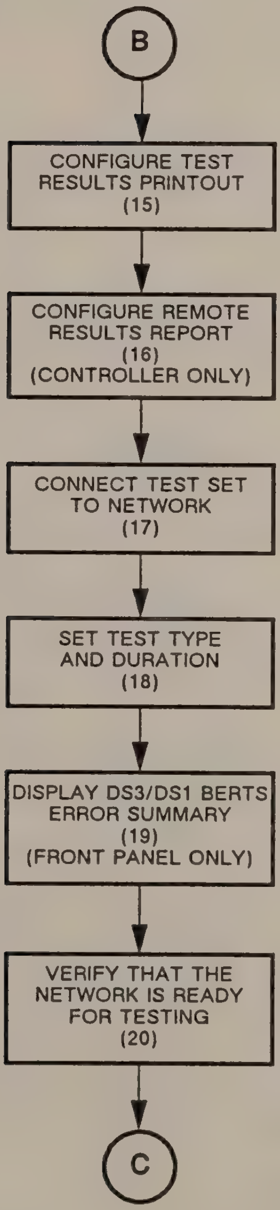
SET UP DS3 TRANSMITTER FUNCTION

Front Panel Operation	Controller Operation
1. Select **Setup XMTR** key to set up the transmitter. Move ■ to **DS3 BERTS**. Press **ENTER**. Result – **XMTR** LED lights. The LCD shows the DS3 BERTS XMTR SETUP **page**.	1. Address DS3 transmitter function: (enter ADDR DS3-TX).
2. Select **Output**. Set transmitter framing for the network **Frame** type (example: **m13**). Result – a ■ is next to **m13**.	2. Set the test set transmitter framing for the network frame type: (example: enter FRAME M13).
3. Set signal **Level** (example: **dsx/low**). Result – a ■ is next to **dsx/low**. DSX OVERRIDE message indicates you should check LEVEL switch setting.	3. Set signal level: (example: enter LEVEL DSX).
4. Select **Pattern** type (example: **prbs**, example: **15**). Result – a ■ is next to **prbs** and **15**.	4. Set pattern type: (example: enter PATTERN PRBS-15).
5. Select the value for X-bits. Move ■ to **Miscellaneous** field then to **Xbit** field (example: **1**). Result – a ■ is next to **1**.	5. Set value for X-bits: (example: enter XBIT 1).
6. Select the clock source for the output signal. Move ■ to the **Clock** field and make choice (example: **internal**). Result – a ■ is next to **internal**.	6. Select clock source for output signal: (example: enter CLOCK DS3-TX INT).
7. Set up Error Insertion functions. Move the ■ to **Errors** field, then to **Insert** field (example: **single**). Result– a ■ is next to **single**.	7. Error Insertion functions are setup and enabled at the same time, (in step 21) so no initial setup is necessary.
8. Enable single errors for insertion with the **ERR INS** key (example: for **Pattern** choose **bit**, Frame choose **fbit**, and **Coding** choose **off**). Result – a ■ is next to **bit**, **fbit** and **off**.	


A
SELECT DS3 RECEIVER (9)
SELECT INPUT SIGNAL LEVEL (10)
SELECT FRAME PREFERENCE (11)
SELECT MODE OF TEST RESULTS REPORT (12)
CONFIGURE FRONT PANEL DISPLAY (13)
SETUP ERROR THRESHOLDS (14)
B

SET UP DS3 RECEIVER FUNCTION

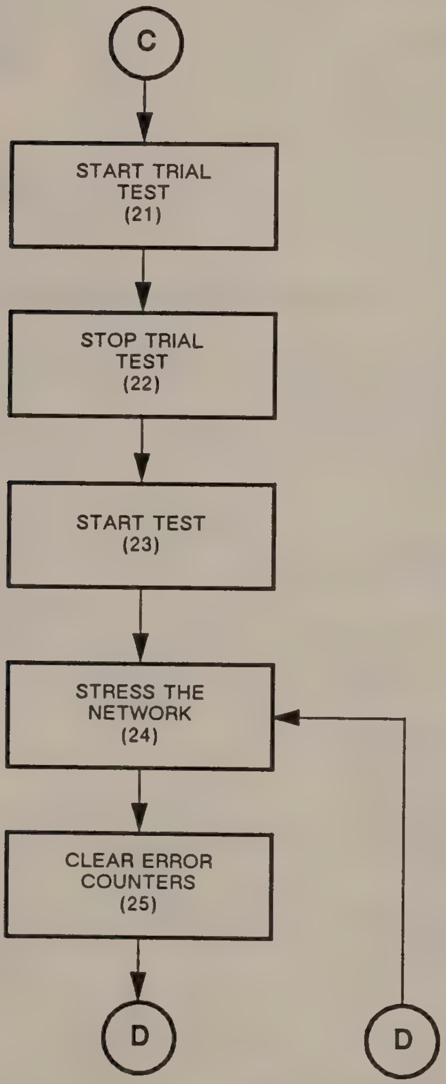
Front Panel Operation	Controller Operation
9. Press **RCVR/THRU** key to set up the receiver. Move ■ to select **DS3 BERTS** and press **ENTER**. Result – The LCD shows the DS3 BERTS RCVR SETUP **page**.	9. Address DS3 receiver function: (enter ADDR DS3-RX).
10. Select **Modes**. Select input signal level. Move ■ to **Level** fields (example: **dsx/low**). Result – a ■ is next to **dsx/low**.	10. Select input signal level: (example: enter LEVEL DSX).
11. Select **Frame preference** for auto framing algorithm. Move ■ to **Frame preference** fields (example: **m13**). Result – a ■ is next to **m13**.	11. Select frame preference for auto framing algorithm: (example: enter PREF M13).
12. Select the mode of the test results report. Move ■ to **Report** field (example: **events**). Result – a ■ is next to **events**.	12. Select mode of the test results Report: (example: enter REPORT PRINTER EVENTS).
13. Set up Front Panel display. Move the ■ to **Display** field, then to the **Display error results** field (example: **all**). Result – a ■ is next to **all**.	13. Set up front panel display: (example: enter SET-DISPLAY ALL).
14. Set up error thresholds. Move ■ to **Thresh** field,then to **Program** field to select the error type. To set the thresholds – • move the ■ to **Program** (example: **bit**), • move ■ to **Dribbling**, • press ▶ to move ■ to the threshold value field. • Use the ▶/◀ keys to get to digits. • Use ▲/▼ keys to set digits. • Press **ENTER** to set value. Repeat this procedure for **Bursty** and **Severely** threshold values and for each error type **Program** (**fbit** and **parity**). Result – the LCD shows the error thresholds.	14. Setup the error thresholds. Start with the bit error thresholds: (example: enter THRES-B 1,2,45). Then set the F-bit error thresholds: (example: enter THRES-F 1,2,45). Finally, set the parity error thresholds: (example: enter THRES-P 1,2,45).


B
CONFIGURE TEST RESULTS PRINTOUT (15)
CONFIGURE REMOTE RESULTS REPORT (16) (CONTROLLER ONLY)
CONNECT TEST SET TO NETWORK (17)
SET TEST TYPE AND DURATION (18)
DISPLAY DS3/DS1 BERTS ERROR SUMMARY (19) (FRONT PANEL ONLY)
VERIFY THAT THE NETWORK IS READY FOR TESTING (20)
C

Front Panel Operation	Controller Operation
15. Set up Test Results printout. (optional). Move ■ to **Print** field, then to **Printout test results** field (example: **all**). Result – a ■ is next to **all**.	15. Set up the Test Results Printout (optional). Select the RS-232 port for printer output: (example: enter PRINT-DEV COM2) Select Results printout format: (example: enter SET RESULTS ALL).
	16. Set up Remote Results Report. Select mode for Remote Results: (example: enter REPORT REMOTE EVENTS).

START THE NETWORK TEST

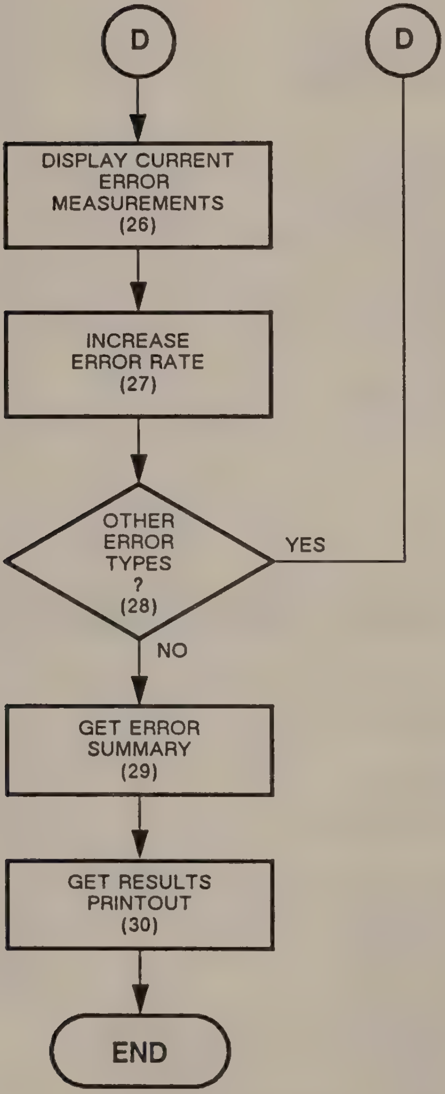
Front Panel Operation	Controller Operation
17. Connect AT 9500 to the network. Connect a cable between DS3 TX1 and the network. Connect a return cable from the network to DS3 RX input.	17. Connect AT 9500 to the network. Connect a cable between DS3 TX1 and the network. Connect a return cable between the network and DS3 RX input.
18. Set test type and duration by pressing **Test TIME** key. Move ■ to select **Test** type (example: **single**). Move ■ to **Duration** field • press ▶ to enter the **Duration** value field. • Use ▶/◀ keys to access digits. • Use ▲/▼ keys to set digits. • Press **ENTER** to set value. Result – The **page Duration** field shows the test duration.	18. Set the test type and duration (example: enter TEST-TYPE SINGLE and example: enter TIMER xx:yy:zz where: xx = hours yy = minutes zz = seconds
Optional – Use ■ and **ENTER** to set current date and time on the **page**.	Optional – Set current time and date: (example: enter TIME xx:yy:zz) (example: enter DATE aa/bb) where: aa = month bb = day
19. Press **SUMMARY** in **Results** section. Result – The screen changes to show a DS3/DS1 BERTS error summary page.	
20. Verify the network is ready for test. First, look at the **Status DS3 LEDs.** Result – all red LEDs under DS3 should be OFF.	20. Verify network is ready to test. First, check Receiver Status: (example: enter STATUS) Status report should show: Signal Loss = no Pattern Loss = no Frame Loss = no


C
START TRIAL TEST (21)
STOP TRIAL TEST (22)
START TEST (23)
STRESS THE NETWORK (24)
CLEAR ERROR COUNTERS (25)
D
D

Front Panel Operation	Controller Operation
21. Next press **RUN/STOP** key to start a trial test. Insert a single bit and F–bit error by pressing **SHIFT** plus **ERR INS** keys. Result – a single es (error second) should appear in the **bit es** and **fbit** es display area.	21. Next start a trial test: (enter RUN). Insert a single bit and F–bit error: (example: enter ERRORS DS3–TX BIT FBIT). Then check to verify errors passed through the network: (enter STOP), (example: enter SUMMARY DS3–RX).
22. Stop the trial test. Press **RUN/STOP** key to end the trial. If any red **Status DS3 LEDs** are ON and the screen does not show the bit es – • check the cable connections between AT 9500 and the network • check test set up • check the network for improper configuration	22. The Summary report should verify that a bit error second and an F–bit error second have been detected. If you get an LOS, OOF or LOP indication or if the single error was not on the Summary report – • check the cable connections between the AT 9500 and the network • check the test set up • check the network for improper configuration.

START THE NETWORK STRESS TEST

23. After establishing the network configuration, start the test by pressing **RUN**. Notice network performance for reference during remainder of test.	23. After establishing the network configuraton, start the test (enter RUN). Notice network performance for reference during remainder of test.
24. To stress the network, add errors to the transmitter output. Select **Setup XMTR** key and use ■ and **ENTER** to select **DS3 BERTS**. • Move ■ over to **Errors** field and down to **Insert: ber** (error rate) selection field. • Move ■ down to **Rate** field. • Press ▶ to move ■ over to error rate field. • Use ▲/▼ keys to set **Rate** (example: 1.00–6) and press **ENTER**. • Select **bit** in **Err** field. Result – A ■ is next to **ber** and **bit**. **Rate** indicates 1.00–6.	24. To stress the network, add errors to the transmitter output: (example: enter ERRORS DS3–TX BIT BER 1E–6)
25. Reset the test to clear error counters (press **RUN/STOP** key). Result – The error counters are reset.	25. Reset the test to clear error counters: (enter RERUN)


D
D
DISPLAY CURRENT ERROR MEASUREMENTS (26)
INCREASE ERROR RATE (27)
OTHER ERROR TYPES ? (28)
YES
NO
GET ERROR SUMMARY (29)
GET RESULTS PRINTOUT (30)
END

Front Panel Operation	Controller Operation
26. To see current error measurements, press **Results MEASUREMENTS DS3/DS1** key until DS3 LED lights. Then use ▲/▼ keys to look at available DS3 measurements.	26. To observe the current error measurements: (example: enter RESULTS DS3-RX ALL).
27. Gradually increase error rate by repeating step 24 (selecting higher error rates) until you find the network operational limits.	27. Gradually increase error rate by repeating test step 24 (selecting higher error rates) until you find network operational limits.
28. If you need to stress the network with a different error type than **bit**, select a new entry for **Err** in step 24 (substitute **bpv**, **code**, **combo**, **fbit**, **par**, **cbit/p** or **febe** for **bit**.	28. If you need to stress the network with a different error type than **bit** select a different error type for BIT in step 24. Available choices are: BPV, CODE, COMBO, FBIT, PAR, CBIT/P, or FEBE.

EXAMINE THE NETWORK TEST RESULTS

29. At the end of the test, **Results MEASUREMENTS DS3 page** shows the error seconds Summary of the completed test. Find other measurements by scrolling through the **pages** under **DS3/DS1 MEASUREMENTS** key. Press the key until the **DS3 LED** lights, and then use ▲/▼ keys to see available DS3 measurements. Result – The screen shows the test measurements.	29. At both the start and finish of the test, the Controller user gets a results report. A change in operational status (LOS, OOF, PAT LOSS, BLUE, ETC.) during the test also causes the generation of a Results report.
30. At any time, you can get a results printout by pressing **SHIFT** plus **PRINT** key.	30. At any time, you can initiate a report output on the printer port: (example: enter PRINT DS3-RX).

DS1 NETWORK TEST

A DS1 network test checks the operational status of the payload and overhead bits of a digital network. Use this test to identify the possible sources of the problem. Prior to this test you should:

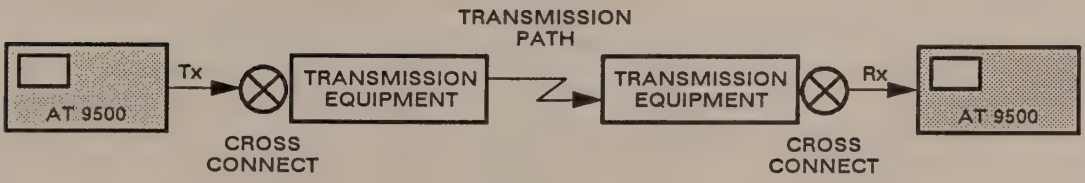
- Read the first three Chapters and Basic Applications of the manual.
- Watch the training video.
- Get the necessary cables to connect to the network. See the following figures since this is an out-of-service test.
- Decide between front panel or controller operation of the test.
- Review the Conventions described at the beginning of Advanced Applications.

During the DS1 Network Test you will do the following:

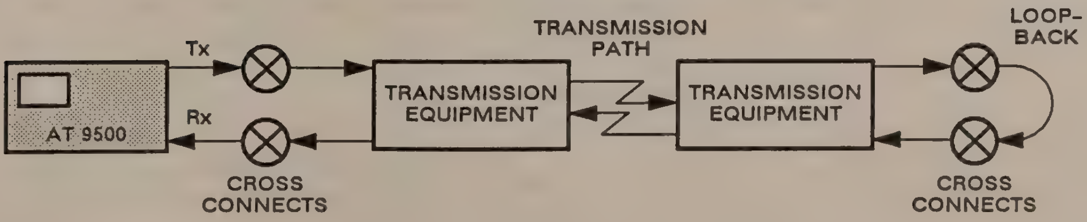
- Set up the DS1 transmitter.
- Set up the DS1 receiver.
- Run the test.
- Examine the results.

NOTE

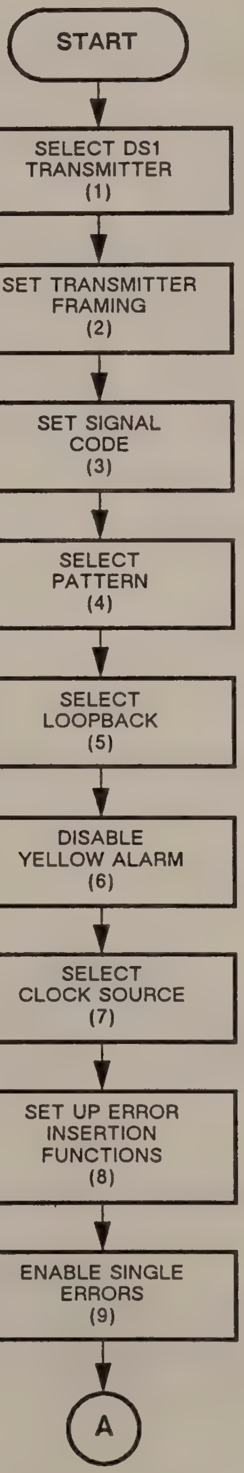
Be sure the AT 9500 is in STOP-mode before you start a test.



Out-of-Service End-to-End Error Rate Test

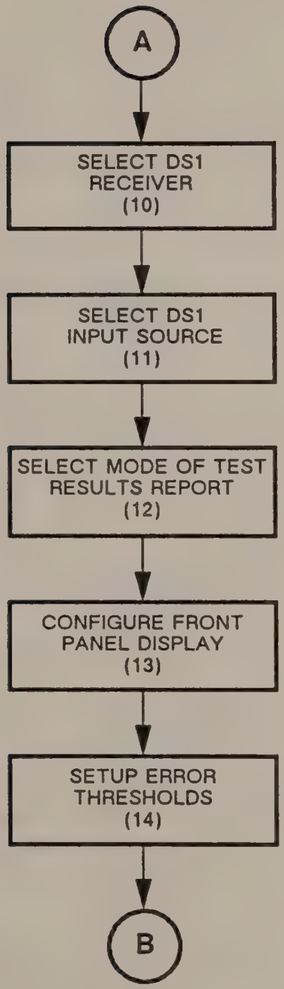


Out-of-Service Loopback Error Rate Test


START
SELECT DS1 TRANSMITTER (1)
SET TRANSMITTER FRAMING (2)
SET SIGNAL CODE (3)
SELECT PATTERN (4)
SELECT LOOPBACK (5)
DISABLE YELLOW ALARM (6)
SELECT CLOCK SOURCE (7)
SET UP ERROR INSERTION FUNCTIONS (8)
ENABLE SINGLE ERRORS (9)
A

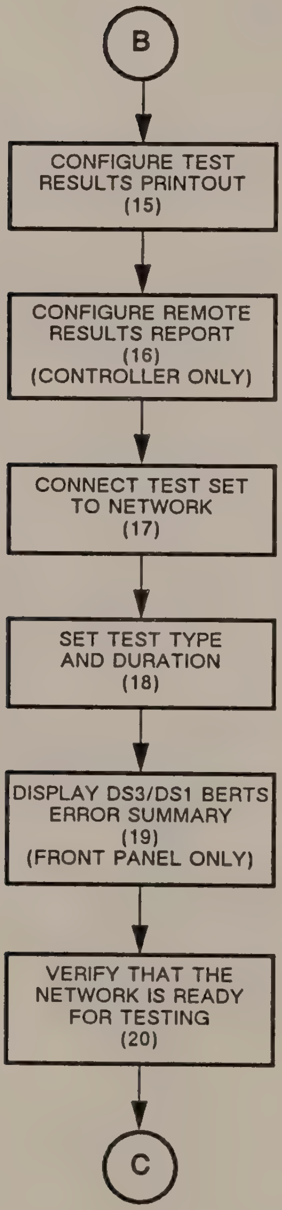
SETUP DS1 TRANSMITTER FUNCTION

Front Panel Operation	**Controller Operation**
1. Select **Setup XMTR** key to set up the transmitter. Move the ■ to **DS1 BERTS** and press **ENTER**. Result – The LCD shows the DS1 BERTS XMTR SET UP **page**.	1. Address DS1 transmitter function: (enter ADDR DS1–TX).
2. Set transmitter framing for the network frame type (example: **SF**). Result – a ■ is next to **SF**.	2. Set the test set transmitter for for the network frame type: (example: enter FRAME SF).
3. Set signal code (example: **b8zs**). Result – a ■ is next to **b8zs**.	3. Set signal coding: (example: enter CODE B8ZS).
4. Select pattern type (example: **PRBS**, example: **20**). Result – a ■ is next to **prbs** and **20**.	4. Set pattern type: (example: enter PAT PRBS–20).
5. Select **Loopback**. Move ■ down to selection field (example: **off**). Result – a ■ is next to **off**.	5. Set value for loopback: (example: enter LOOPBACK OFF).
6. Disable Yellow Alarm. Select **MISCELLANEOUS**. Move ■ to Yellow Alarm field and make choice (example: **off**).	6. Disable Yellow Alarm: (example: enter YELLOW OFF).
7. Select clock source for the output signal. Move ■ **Clock** field and make choice (example: **internal**). Result – a ■ is next to **internal**.	7. Select clock source for the output signal: (example: enter CLOCK INT).
8. Set up Error Insertion functions. Move the ■ to **Errors** field, then to **Insert** field (example: **single**). Result– a ■ is next to **single**.	8. Error Insertion functions are setup and enabled at the same time, (in step 22) so no initial setup is necessary.
9. Enable single errors for insertion with the **ERR INS** key (example: for **Pattern** choose **bit**, Frame choose **fbit**, and Coding choose **off**). Result – a ■ is next to **bit**, **fbit** and **off**.	


A
SELECT DS1 RECEIVER (10)
SELECT DS1 INPUT SOURCE (11)
SELECT MODE OF TEST RESULTS REPORT (12)
CONFIGURE FRONT PANEL DISPLAY (13)
SETUP ERROR THRESHOLDS (14)
B

SETUP DS1 RECEIVER FUNCTION

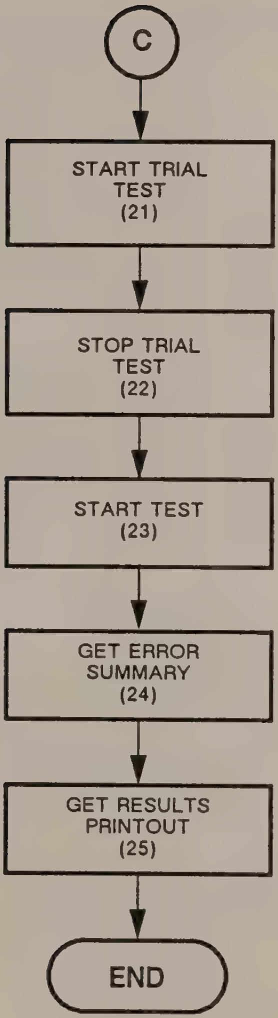
Front Panel Operation	Controller Operation
10. Select front panel **RCVR/THRU** key to set up the test set receiver. Move ■ to **DS1 BERTS** and press **ENTER**. Result – The LCD shows the DS1 BERTS RCVR SET UP **page**.	10. Address DS1 receiver function: (enter ADDR DS1–RX).
11. Select DS1 input source.Move ■ to **Input source** fields (example: **external**). Result – a ■ is next to **external**.	11. Select DS1 input source: (example: enter INPUT EXT).
12. Select mode of the test results report. Move ■ to **Report** field (example: **events**). Result – a ■ is next to **events**.	12. Select mode of the test results Report: (example: enter REPORT PRINTER EVENTS).
13. Set up Front Panel display. Move the ■ to **Display** field, then to the **Display error results** field (example: **all**). Result – a ■ is next to **all**.	13. Set up Front Panel display: (example: enter SET–DISPLAY ALL).
14. Set up error thresholds. Move ■ to **Thresh** field, then to **Program** field to select the error type. To set the thresholds – • move the ■ to **Program** (example: bit), • move ■ to **Dribbling**, • press ▶ to move ■ to the threshold value field. • Use ▶/◀ keys to get to digits. • Use ▲/▼ keys to set digits. • Press **ENTER** to set value. Repeat this procedure for **Bursty** and **Severely** threshold values and for each error type **Program** (**fbit** and **crc6**). Result – the LCD shows the error thresholds.	14. Setup the error thresholds. Start with the bit error thresholds: (example: enter THRES–B 1,2,1536). Then set the F–bit error thresholds: (example: enter THRES–F 1,2,1536). Finally, set the crc6 error thresholds: (example: enter THRES–C 1,2,1536).


B
CONFIGURE TEST RESULTS PRINTOUT (15)
CONFIGURE REMOTE RESULTS REPORT (16) (CONTROLLER ONLY)
CONNECT TEST SET TO NETWORK (17)
SET TEST TYPE AND DURATION (18)
DISPLAY DS3/DS1 BERTS ERROR SUMMARY (19) (FRONT PANEL ONLY)
VERIFY THAT THE NETWORK IS READY FOR TESTING (20)
C

Front Panel Operation	Controller Operation
15. Set up Test Results printout. (optional). Move ■ to **Print** field, then to **Printout test results** field (example: **all**). Result – a ■ is next to **all.**	15. Set up the Test Results Printout (optional). Select the RS-232 port for printer output: (example: enter PRINT-DEV COM2). Select Results printout format: (example: enter SET-RESULTS ALL).

START THE NETWORK TEST

Front Panel Operation	Controller Operation
	16. Set up Remote Results Report. Select mode for Remote Results:(example: enter REPORT REMOTE EVENTS).
17. Connect AT 9500 to the network. Connect a cable between **DS1 TX** and the network. Connect a return cable between the network and **DS1 RX** input.	17. Connect AT 9500 to the network. Connect a cable between **DS1 TX** and the network. Connect a return cable between the network and **DS1 RX** input.
18. Set test type and duration by pressing **Test TIME** key. Move ■ to select **Test** type (example: **single**). Move ■ to **Duration** field – • press ▶ to enter the **Duration** value field. • Use ▶/◀ keys to access digits. • Use ▲/▼ keys to set digits. • Press **ENTER** to set value. Result – The **page Duration** field shows the test duration.	18. Set the test type and duration (example: enter TEST-TYPE SINGLE and example: enter TIMER xx:yy:zz where: xx = hours yy = minutes zz = seconds
Optional – Use ■ and ENTER to set current date and time on the **page**.	Optional – Set current date and time: (example: enter TIME xx:yy:zz) (example: enter DATE aa/bb) where: aa = month bb = day
19. Press **SUMMARY** in the **Results** section of the front panel. Result – The screen changes to show a DS3/DS1 BERTS error summary **page**.	
20. Verify the network is ready for testing. First, look at the **DS1 Status** LEDs. Result – all red LEDs under **DS1** should be OFF.	20. Verify network is ready to test. First, check Receiver Status: (example: enter STATUS). Result – Status report should show: Signal Loss= no Frame Loss = no Pattern Loss = no


C
START TRIAL TEST (21)
STOP TRIAL TEST (22)
START TEST (23)
GET ERROR SUMMARY (24)
GET RESULTS PRINTOUT (25)
END

Front Panel Operation	Controller Operation
21. Next press **RUN/STOP** key to start a trial test. Enter a single bit and F-bit error by pressing the **SHIFT** plus **ERR INS** keys. Result – a single es (error second) appears in **bit es** and **fbit es** fields. (enter STOP)	21. Next start a trial test: (enter RUN). Insert a single bit and F-bit error: (enter ERRORS DS1-TX BIT FBIT). Then check to verify errors passed through the network: (enter SUMMARY DS1-RX).
22. Stop the trial test. Press the STOP key to end the trial. If any red Status DS3 LEDs are ON and the screen does not show the bit es – • check cable connections between AT 9500 and the network • check test set up • check the network for improper configuration.	22. The Summary report should verify that a bit error second and an F-bit error second have been detected. If LOS, OOF or LOP light or if the single error was not on the Summary report, • check cable connections between the AT 9500 and the network • check the test set up • check network for improper configuration.
23. Once the network configuration is established, start the test by pressing the **RUN** key.	23. Once the network configuration is established, start the test: (enter RUN).

EXAMINE THE NETWORK TEST RESULTS

Front Panel Operation	Controller Operation
24. At the end of the test, the screen shows the error seconds Summary of the completed test. You can find other error measurements by scrolling through the pages under the **DS3/DS1 MEASUREMENTS** key. Press the key until the **DS1 LED** lights, and then use the **▲/▼** keys to get DS1 measurements.	24. At both the start and finish of the test, the AT 9500 provides a Results report printout to the controller user. A change in the operating status (LOS, OOF, PAT LOSS, A1S, etc.) during the test also causes a Results report to be generated.
25. At any time, you can get a results printout by the pressing the **SHIFT** plus **PRINT** key.	25. At any time, you can initiate a report output on the printer port: (enter PRINT DS1-RX).

DS1 STRESS TEST

A DS1 Stress Test is an out-of-service test that checks the payload and overhead bit operational limitations of a digital network. In a DS1 Stress Test you inject errors into the transmitter output, then insert the errors into the DS1 digital network. Use an AT 9500 receiver to analyze the return signals. Prior to this test you should:

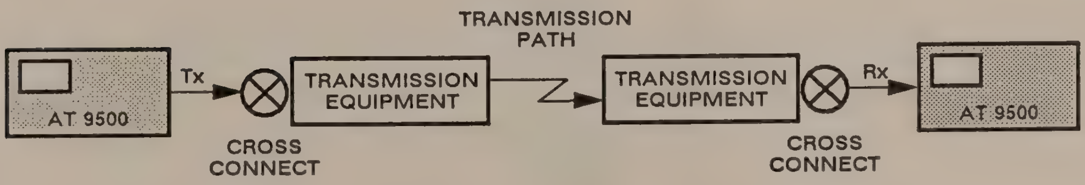
- Read the first three Chapters and Basic Applications.
- Watch the training video.
- Get the necessary cables to connect to the network. See the following figures since this is an out-of-service test.
- Decide between front panel or controller operation of the test.
- Review the Conventions described at the beginning of Advanced Applications.

During the DS1 Stress Test you will:

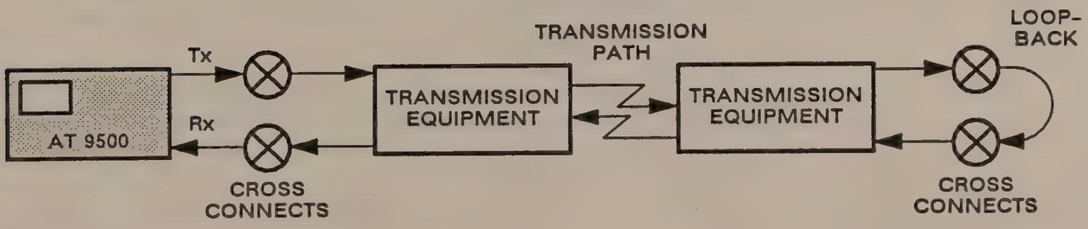
- Set up the DS1 transmitter.
- Set up the DS1 receiver.
- Validate the network configuration.
- Run the test.
- Examine the results.

NOTE

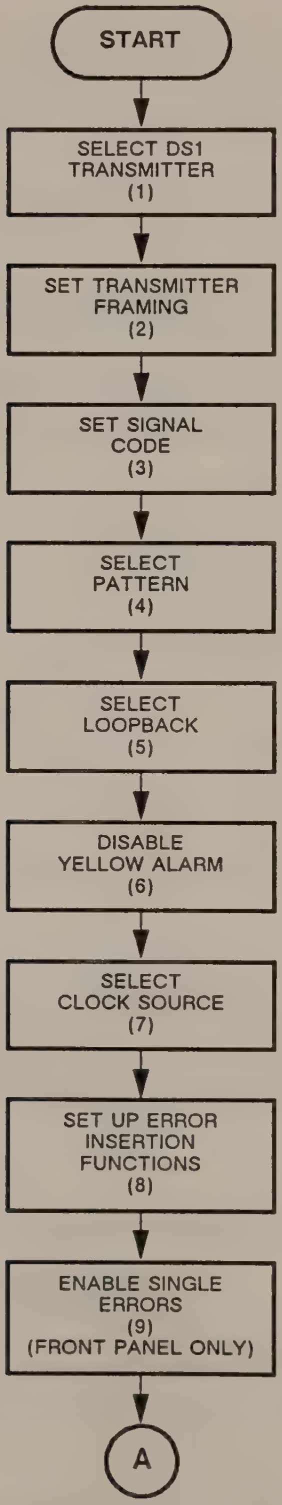
Be sure the AT 9500 is in STOP-mode before you start a test.



Out-of-Service End-to-End Error Rate Test

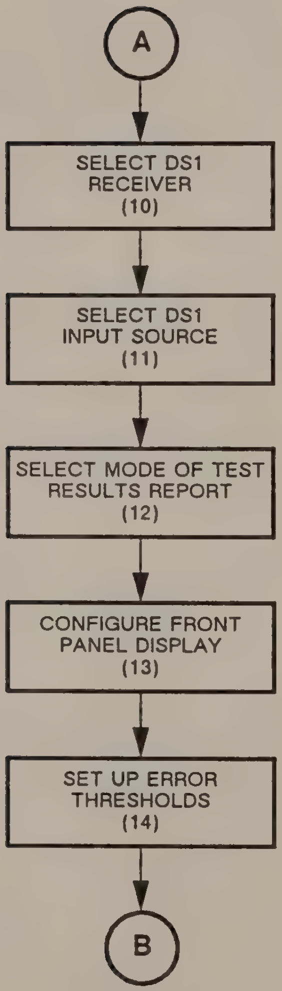


Out-of-Service Loopback Error Rate Test


START
SELECT DS1 TRANSMITTER (1)
SET TRANSMITTER FRAMING (2)
SET SIGNAL CODE (3)
SELECT PATTERN (4)
SELECT LOOPBACK (5)
DISABLE YELLOW ALARM (6)
SELECT CLOCK SOURCE (7)
SET UP ERROR INSERTION FUNCTIONS (8)
ENABLE SINGLE ERRORS (9) (FRONT PANEL ONLY)
A

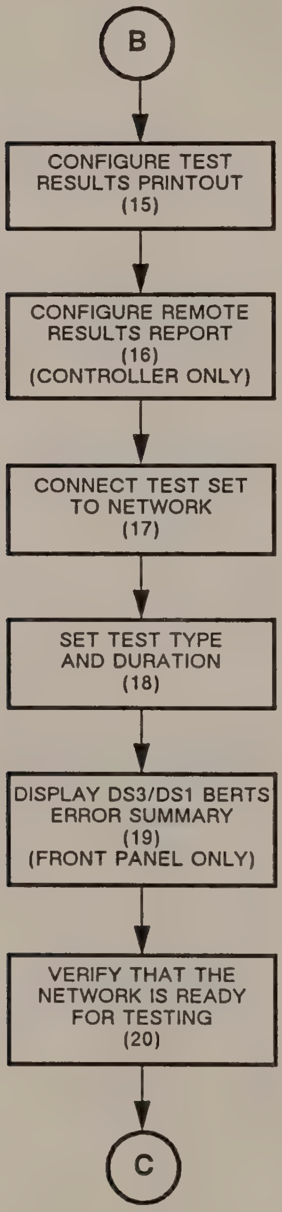
SETUP DS1 TRANSMITTER FUNCTION

Front Panel Operation	Controller Operation
1. Select **Setup XMTR** key to set up the transmitter. Move the ■ to DS1 BERTS and press **ENTER**. Result – The LCD shows the DS1 BERTS XMTR SETUP page.	1. Address DS1 transmitter function: (enter ADDR DS1-TX).
2. Set transmitter framing for the network frame type (example: **SF**). Result – a ■ is next to **SF**.	2. Set the test set transmitter for the network frame type: (example: enter FRAME SF).
3. Set signal code (example: **b8zs**). Result – a ■ is next to **b8zs**.	3. Set signal coding: (example: enter CODE B8ZS).
4. Select pattern type (example: **PRBS**, example: **20**). Result – a ■ is next to **PRBS** and **20**.	4. Set pattern type: (example: enter PAT PRBS-20).
5. Select **Loopback**. Move ■ down to selection field (example: **off**). Result – a ■ is next to **off**.	5. Set value for loopback: (example: enter LOOPBACK OFF).
6. Disable Yellow Alarm. Select **MISCELLANEOUS**. Move ■ to Yellow Alarm field and make choice (example: **off**).	6. Disable Yellow Alarm. (example: enter YELLOW OFF).
7. Select clock source for the output signal. Move ■ to Clock field and make choice (example: **internal**). Result – a ■ is next to **internal**.	7. Select clock source for the output signal: (example: enter CLOCK INT).
8. Set up Error Insertion functions. Move the ■ to **Errors** field, then to **Insert** field (example: **off**). Result – a ■ is next to **off**.	8. Error Insertion functions are setup and enabled at the same time, (in step 22) so no initial setup is necessary.
9. Enable single errors for insertion with the **ERR INS** key (example: for **Pattern** choose **bit**, Frame choose **fbit**, and Coding choose **off**). Result – a ■ is next to **bit**, **fbit** and **off**.	


A
SELECT DS1 RECEIVER (10)
SELECT DS1 INPUT SOURCE (11)
SELECT MODE OF TEST RESULTS REPORT (12)
CONFIGURE FRONT PANEL DISPLAY (13)
SET UP ERROR THRESHOLDS (14)
B

SETUP DS1 RECEIVER FUNCTION

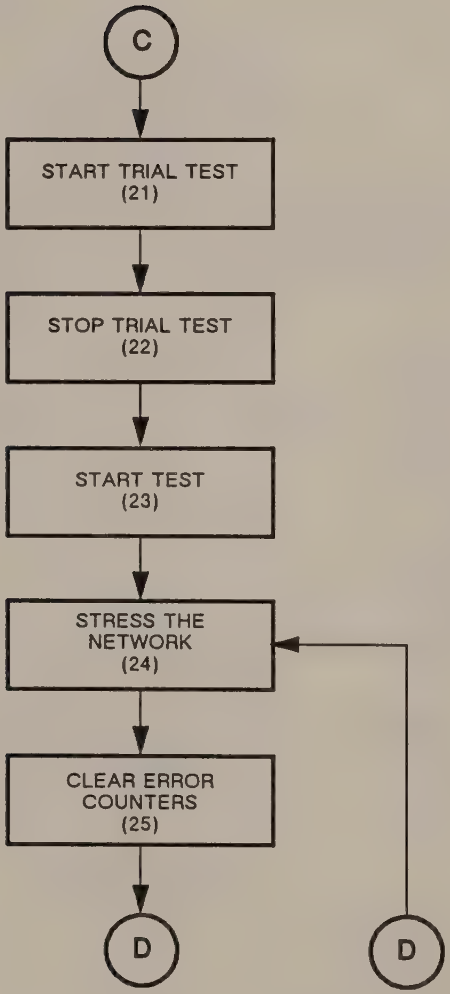
Front Panel Operation	Controller Operation
10. Select front panel **RCVR/THRU** key to set up the test set receiver. Move ■ to **DS1 BERTS** and press **ENTER**. Result – The LCD shows the DS1 BERTS RCVR SET UP page.	10. Address DS1 receiver function: (enter ADDR DS1–RX).
11. Select DS1 input source. Move ■ to **Input source** fields (example: **external**). Result – a ■ is next to **external**.	11. Select DS1 input source: (example: enter INPUT EXT).
12. Select the mode of the test results report. Move ■ to **Report** field (example: **events**). Result – a ■ is next to **events**.	12. Select mode of the test results Report: (example: enter REPORT PRINTER EVENTS).
13. Set up front panel display. Move the ■ to **Display** field, then to the **Display error results** field (example: **all**). Result – a ■ is next to **all**.	13. Set up Front Panel display: (example: enter SET–DISPLAY ALL).
14. Set up error thresholds. Move ■ to **Thresh** field then to **Program**, field to select the error type. To set the thresholds – • move the ■ to **Program** (example: **bit**), • move ■ to **Dribbling**, • press ▶ to move ■ to the threshold value field. • Use ▶/◀ keys to get to digits. • Use ▲/▼ keys to set digits. • Press **ENTER** to set value. Repeat this procedure for **Bursty** and **Severely** threshold values and for each error type **Program** (**fbit** and **crc6**). Result – the LCD shows the error thresholds.	14. Setup the error thresholds. Start with the bit error thresholds: (example: enter THRES–B 1,2,1536). Then set the F–bit error thresholds: (example: enter THRES–F 1,2,1536). Finally, set the parity error thresholds: (example: enter THRES–C 1,2,1536).


B
CONFIGURE TEST RESULTS PRINTOUT (15)
CONFIGURE REMOTE RESULTS REPORT (16) (CONTROLLER ONLY)
CONNECT TEST SET TO NETWORK (17)
SET TEST TYPE AND DURATION (18)
DISPLAY DS3/DS1 BERTS ERROR SUMMARY (19) (FRONT PANEL ONLY)
VERIFY THAT THE NETWORK IS READY FOR TESTING (20)
C

Front Panel Operation	**Controller Operation**
15. Set up Test Results printout. (optional). Move ■ to **Print** field, then to **Printout test results** field (example: **all**). Result – a ■ is next to **all**.	15. Set up the Test Results Printout (optional). Select the RS–232 port for printer output: (example: enter PRINT–DEV COM2) Select Results printout format: (example: enter SET–RESULTS ALL).
	16. Set up Remote Results Report. Select mode for Remote Results: (example: enter REPORT REMOTE EVENTS).

START THE NETWORK TEST

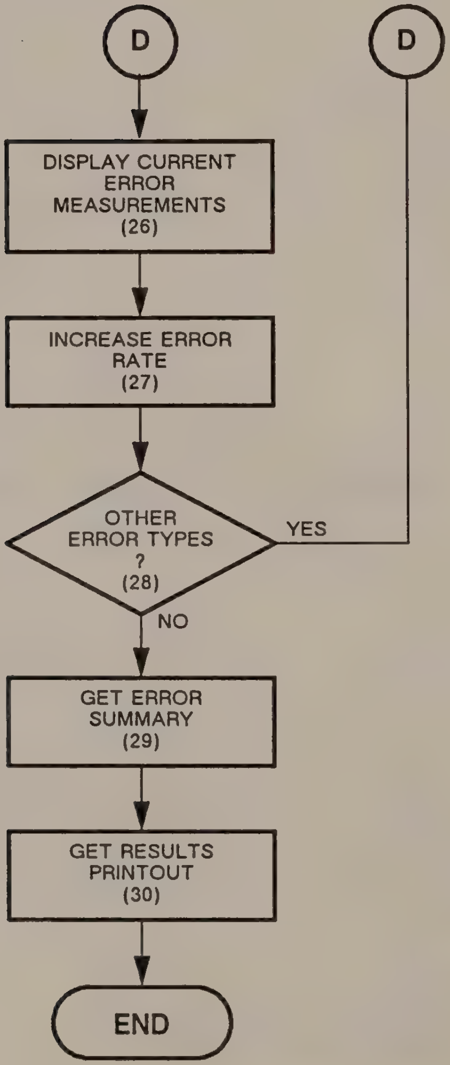
17. Connect AT 9500 to the network. Connect a cable between **DS1 TX** and the network input. Connect a return cable between the network output and **DS1 RX** input.	17. Connect AT 9500 to the network. Connect a cable between DS1 TX and the network input. Connect a return cable between the network output and DS1 RX input.
18. Set test type and duration by pressing **Test TIME** key. Move ■ to select **Test** type (example: **single**). Move ■ to **Duration** field – • press ▶ to enter the **Duration** value field. • Use ▶/◀ keys to access digits. • Use ▲/▼ keys to set digits. • Press ENTER to set value. Result – The **page Duration** field shows the test duration.	18. Set the test type and duration (example: enter TEST–TYPE SINGLE and example: enter TIMER xx:yy:zz where: yy = minutes xx = hours zz = seconds
Optional – Use ■ and ENTER to set current date and time on the page.	Optional – Set current date and time: (example: enter TIME xx:yy:zz) (example: enter DATE aa/bb) where: aa = month bb = month
19. Press **SUMMARY** in the **Results** section of the front panel. Result – The screen changes to show a DS3/DS1 BERTS error summary **page**.	
20. Verify the network is ready for testing. First, look at the **DS1 Status** LEDs. Result – all red LEDs under DS1 should be OFF.	20. Verify network is ready to test. First, check Receiver Status: (example: enter STATUS) Result – Status report should show: Signal Loss = no Frame Loss = no Pattern Loss = no


C
START TRIAL TEST
(21)
STOP TRIAL TEST
(22)
START TEST
(23)
STRESS THE
NETWORK
(24)
CLEAR ERROR
COUNTERS
(25)
D
D

Front Panel Operation	Controller Operation
21. Next press **RUN/STOP** key to start a trial test. Insert a single bit and F-bit error by pressing **SHIFT** plus **ERR INS** keys. Result – a single es (error second) should appear in the **bit es** and **fbit** es display area.	21. Next start a trial test: (enter RUN). Insert a single bit and F-bit error: the (enter ERRORS DS1-TX BIT FBIT). Then check to verify errors passed through the network: (enter SUMMARY DS1-RX).
22. Stop the trial test. Press the STOP key to end the trial. If any red Status DS1 LEDs are ON and the screen does not show the bit es – • check cable connections between AT 9500 and the network • check the test set up • check network for improper configuration.	22. The Summary report should verify that a bit error second and an F-bit error second have been detected. If LOS, OOF or LOP light or if the single error was not on the Summary report, • check cable connections between the AT 9500 and the network • check test set up • check the network for improper configuration.

START THE NETWORK STRESS TEST

Front Panel Operation	Controller Operation
23. After establishing the network configuration, start the test by pressing **RUN**. Notice network performance for reference during remainder of test.	23. After establishing the network configuraton, start the test (enter RUN). Notice network performance for reference during remainder of test.
24. To stress the network, add errors to the transmitter output. Select **Setup XMTR** key and use ■ and **ENTER** to select **DS1 BERTS**. • Move ■ over to **Errors** field and down to **Insert: ber** (error rate) selection field. • Move ■ down to **Rate** field. • Press ▶ to move ■ over to error rate field. • Use ▲/▼ keys to set **Rate** (example: 1.00-6) and press **ENTER**. • Select **bit** in **Err** field. Result – A ■ is next to **ber** and **bit**. **Rate** indicates 1.00-6.	24. To stress the network, add errors to the transmitter output: (example: enter ERRORS DS1-TX BIT BER 1E-6)
25. Reset the test to clear error counters (press **RUN/STOP** key). Result – The error counters are reset.	25. Reset the test to clear error counters: (enter RERUN)


D
D
DISPLAY CURRENT ERROR MEASUREMENTS (26)
INCREASE ERROR RATE (27)
OTHER ERROR TYPES ? (28)
YES
NO
GET ERROR SUMMARY (29)
GET RESULTS PRINTOUT (30)
END

Front Panel Operation	Controller Operation
26. To see current error measurements, press **Results MEASUREMENTS DS3/DS1** key until DS1 LED lights. Then use ▲/▼ keys to look at available DS3 measurements.	26. To observe the current error measurements: (enter RESULTS DS1-RX ALL).
27. Gradually increase error rate by repeating step 24 (selecting higher error rates) until you find the network operational limits. Note – the received error rate is more 1% higher than the transmitted error rate.	27. Gradually increase error rate by repeating test step 24 (selecting higher error rates) until you find network operational limits. Note – the received error rate is more than than 1% higher than the transmitted error rate.
28. If you need to stress the network with a different error type than **bit,** select a new entry for **Err** in step 24 (substitute **off, bpv, code, combo fbit,** or **crc6** for **bit**.	28. If you need to stress the network with a different error type than bit select a different error type for BIT in step 24. Available choices are: OFF, BPV, CODE, COMBO, FBIT, or CRC6.

EXAMINE THE NETWORK TEST RESULTS

Front Panel Operation	Controller Operation
29. At the end of the test, **Results MEASUREMENTS DS3 page** shows the error seconds Summary of the completed test. Find other measurements by scrolling through the **pages** under **DS3/DS1 MEASUREMENTS** key. Press the key until the DS3 LED lights, and then use ▲/▼ keys to see available DS3 measurements. Result – The screen shows the test measurements.	29. At both the start and finish of the test, the Controller user gets a results report. A change in operational status (LOS, OOF,PAT LOSS, A1S, etc.) during the test also causes the generation of a Results report.
30. At any time, you can get a results pressing **SHIFT** plus **PRINT** key.	30. At any time, you can initiate printout by a report output on the printer port: (enter PRINT DS1-RX).

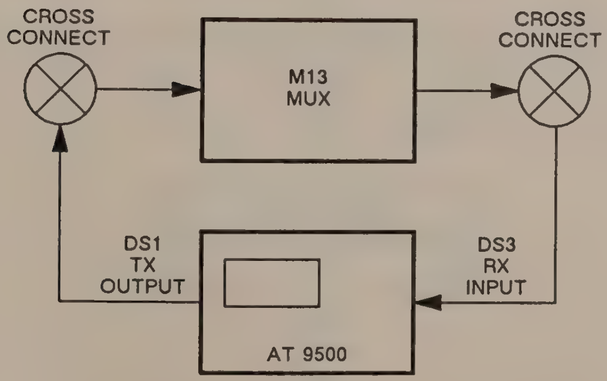
DS3 MUX/DMUX NETWORK TEST

A DS3/DS1 MUX/DMUX Network Test checks a piece of equipment which multiplexes DS1s into a DS3 signal. The test starts by setting up the test set to input a known DS1 signal into a multiplexer (e.g., M13) to form part of a DS3 signal. The test set receiver analyzes the DS1 signal return from the DS3. Prior to this test you should:

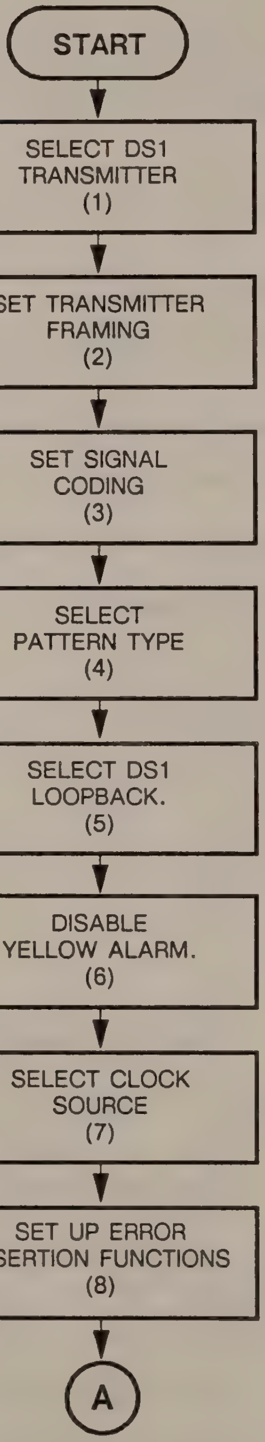
- Read the first three Chapters and the Basic Applications section of the manual.
- Watch the training video.
- Get the necessary cables to connect to the network. (See the following figure.)
- Decide between front panel or controller operation of the test.
- Review the Conventions described at the beginning of Advanced Applications.

During the DS3 MUX/DMUX TEST you will do the following:

- Set up the DS1 transmitter.
- Set up the DS3 receiver.
- Set up the DS1 receiver.
- Validate the network configuration.
- Run the test.
- Examine the results.

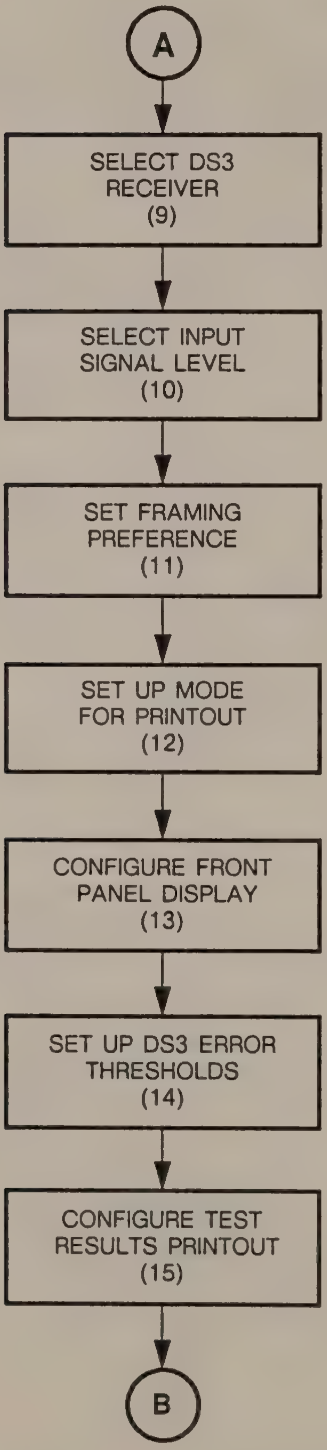


Demultiplex Testing


START
SELECT DS1 TRANSMITTER (1)
SET TRANSMITTER FRAMING (2)
SET SIGNAL CODING (3)
SELECT PATTERN TYPE (4)
SELECT DS1 LOOPBACK. (5)
DISABLE YELLOW ALARM. (6)
SELECT CLOCK SOURCE (7)
SET UP ERROR INSERTION FUNCTIONS (8)
A

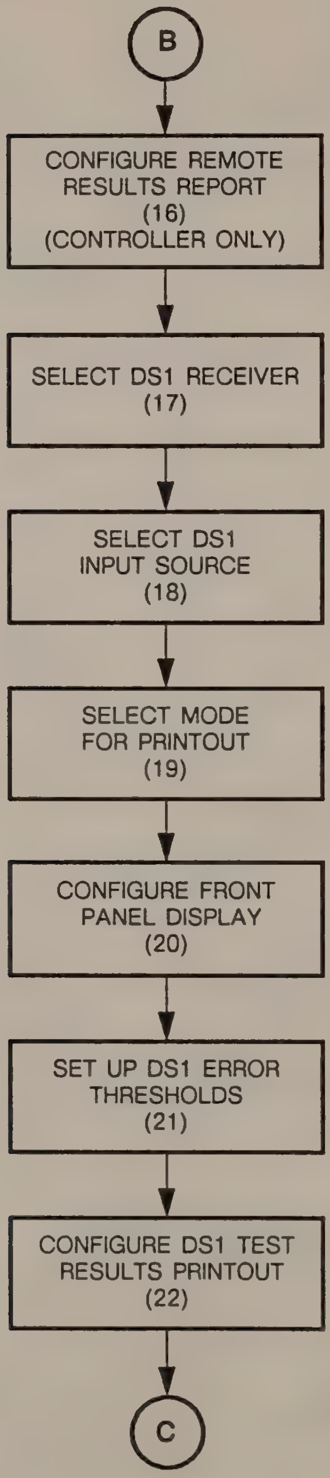
SETUP DS1 TRANSMITTER FUNCTION

Front Panel Operation	Controller Operation
1. Select **Setup XMTR** key to set up the transmitter. Move ■ to **DS1 BERTS**. Press **ENTER**. Result – The LCD shows the DS1 BERTS XMTR SETUP page.	1. Address DS1 transmitter function: (enter ADDR DS1-TX).
2. Set transmitter framing for the network frame type (example: **ESF**). Result – a ■ is next to **ESF**.	2. Set the transmitter framing for the network frame type: (example: enter FRAME ESF).
3. Set signal coding type. (example: **b8zs**). Result – a ■ is next to **b8zs**.	3. Set the signal coding: (example: enter CODE B8ZS).
4. Select a pattern type. (example: **prbs**, example: **20**). Result – a ■ is next to **prbs** and **20**.	4. Select a pattern type: (example: enter PAT PRBS-20)
5. Set DS1 loopback. Select **Loopback** then move ■ to select loopback type (example: **off**). Result – a ■ is next to **off**.	5. Set DS1 loopback: (example: enter LOOPBACK OFF).
6. Disable Yellow Alarm. Select MISCELLANEOUS. Move ■ to Yellow Alarm field and make choice (example: **off**).	6. Disable Yellow Alarm. (example: enter YELLOW OFF).
7. Select the clock source for the output signal. Move ■ to **Clock** field and make choice (example: **internal**). Result – a ■ is next to **internal**.	7. Select the clock source for the output signal: (example: enter CLOCK INT).
8. Set up Error Insertion functions. Move ■ to **Errors** field, then to **Insert** field (example: **off**). Result – a ■ is next to **off**.	8. Error Insertion functions are set up and enabled at the same time, so no initial setup is necessary (example: enter ERRORS OFF).


A
SELECT DS3 RECEIVER (9)
SELECT INPUT SIGNAL LEVEL (10)
SET FRAMING PREFERENCE (11)
SET UP MODE FOR PRINTOUT (12)
CONFIGURE FRONT PANEL DISPLAY (13)
SET UP DS3 ERROR THRESHOLDS (14)
CONFIGURE TEST RESULTS PRINTOUT (15)
B

SETUP DS3 RECEIVER FUNCTION

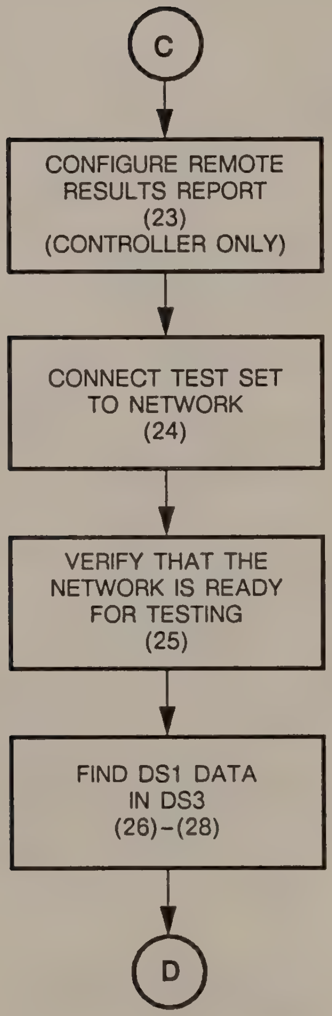
Front Panel Operation	Controller Operation
9. Select **RCVR/THRU** key to set up the receiver. Move ■ to select **DS3** and press **ENTER**. Result – The LCD shows the DS3 BERTS RCVR SETUP page.	9. Address DS3 receiver function: (enter ADDR DS3-RX).
10. Select input signal level. Move ■ to **Level** field (example: **dsx/low**) and press **ENTER**. Result – a ■ is next to **dsx/low**.	10. Select input signal level: (example: enter LEVEL DSX).
11. Select frame preference for auto framing algorithm. Move ■ to **Frame preference** fields (example: **m13**). Result – a ■ is next to **m13**.	11. Select frame preference for auto framing algorithm: (example: enter PREF M13).
12. Select mode of the test results printout. Move ■ to **Report** fields (example: **events**). Result – a ■ is next to **events**.	12. Select mode of the test results printout: (example: enter REPORT PRINTER EVENTS).
13. Set up front panel display. Move the cursor up to the **Display** field, then down to the **Display error result** field (EXAMPLE: **all**) and press **ENTER**. Result – a ■ is next to **all**.	13. Set up Front Panel display: (example: enter SET-DISPLAY ALL).
14. Set up DS3 error thresholds. Move ■ to **Thresh** field, then to **Program** field to select the error type. To set the thresholds – • move the ■ to **Program** (example: **bit**), • move ■ to **Dribbling**, • press ▶ to move ■ to the the threshold value field. • Use the ▶/◀ keys to get to digits. • Use ▲/▼ keys to set digits. • Press **ENTER** to set value. Repeat this procedure for **Bursty** and **Severely** threshold values and for each error type **Program** (**fbit** and **parity**). Result – the LCD shows the error thresholds.	14. Set up the error thresholds. Start with the bit error thresholds: (example: enter THRES-B 1,2,45). Then set the F-bit error thresholds: (example: enter THRES-F 1,2,45). Finally, set the parity error thresholds: (example: enter THRES-P 1,2,45).
15. Configure the Test Results Printout. Move ■ to **Print** field, then to **Printout** test results field (example: **all**). Result – a ■ is next to **all**.	15. Configure Test Results Printout. Select RS-232 port for printer output: (example: enter PRINT-DEV COM2). Select Results printout format: (example: enter SET-RESULTS ALL).


B
CONFIGURE REMOTE RESULTS REPORT (16) (CONTROLLER ONLY)
SELECT DS1 RECEIVER (17)
SELECT DS1 INPUT SOURCE (18)
SELECT MODE FOR PRINTOUT (19)
CONFIGURE FRONT PANEL DISPLAY (20)
SET UP DS1 ERROR THRESHOLDS (21)
CONFIGURE DS1 TEST RESULTS PRINTOUT (22)
C

Front Panel Operation	Controller Operation
	16. Set up Remote Results Report. Select mode for Remote Results: (enter REPORT REMOTE EVENTS).

SETUP DS1 RECEIVER FUNCTION

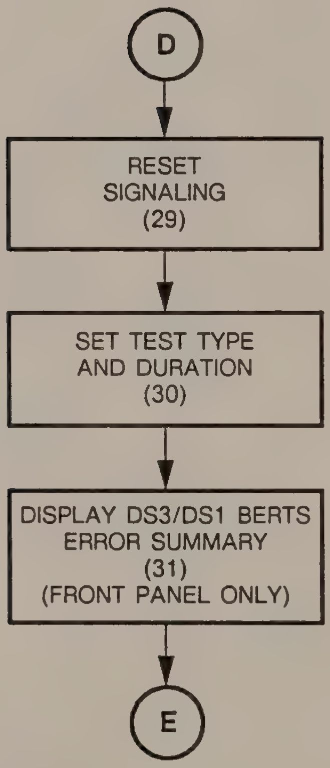
17. Select **RCVR/THRU** key to set up the DS1 receiver. Move ■ to select **DS1 BERTS** and press **ENTER**. Result – The LCD shows the DS1 RCVR BERTS SETUP **page**.	17. Address DS1 receiver function: (enter ADDR DS1–RX).
18. Select DS1 input source. Move ■ to **Input source** fields (example: **demux**). Press **ENTER**. Result – a ■ is next to **demux**.	18. Select DS1 input source: (example: enter INPUT DMUX).
19. Select mode of Test Results printout. Move ■ to **Report** fields (example: **events**). Result – a ■ is next to **events**.	19. Select mode of the test results printout: (example: enter REPORT PRINTER EVENTS).
20. Configure front panel display. Move ■ to **Display** field, then to **Display error results** field (example: **all**). Result – a ■ is next to **all**.	20. Configure Front Panel display: (example: enter SET–DISPLAY ALL).
21. Set up DS1 error thresholds. Move ■ to **Thresh** field, then to **Program** field to select the error type. To set the thresholds – • move the ■ to **Program** (example: **bit**), • move ■ to **Dribbling**, • press ▶ to move ■ to the threshold value field. • Use ▶/◀ keys to get to digits. • Use ▲/▼ keys to set digits. • Press **ENTER** to set value. Repeat procedure for **Bursty** and **Severely** threshold values and for each error type **Program** (**fbit** and **crc6**). Result – the LCD shows the error thresholds.	21. Setup the error thresholds. Start with the bit error thresholds: (example: enter THRES–B 1,2,1536). Then set the F–bit error thresholds: (example: enter THRES–F 1,2,1536). Finally, set the parity error thresholds: (example: enter THRES–C 1,2,1536).
22. Set up DS1 Test Results Printout. Move ■ to **Print** field, then to **Printout test results** field. (example: **all**).	22. Set up DS1 Test Results Printout. Select RS–232 port for printer output: (example: enter PRINT–DEV COM2). Select Results printout format: (example: enter SET–RESULTS ALL)


C
CONFIGURE REMOTE RESULTS REPORT (23) (CONTROLLER ONLY)
CONNECT TEST SET TO NETWORK (24)
VERIFY THAT THE NETWORK IS READY FOR TESTING (25)
FIND DS1 DATA IN DS3 (26)-(28)
D

Front Panel Operation	Controller Operation
	23. Set up DS1 Remote Results Report. Select mode for Remote Results: (example: enter REPORT REMOTE EVENTS).

VALIDATE THE TEST CONFIGURATION

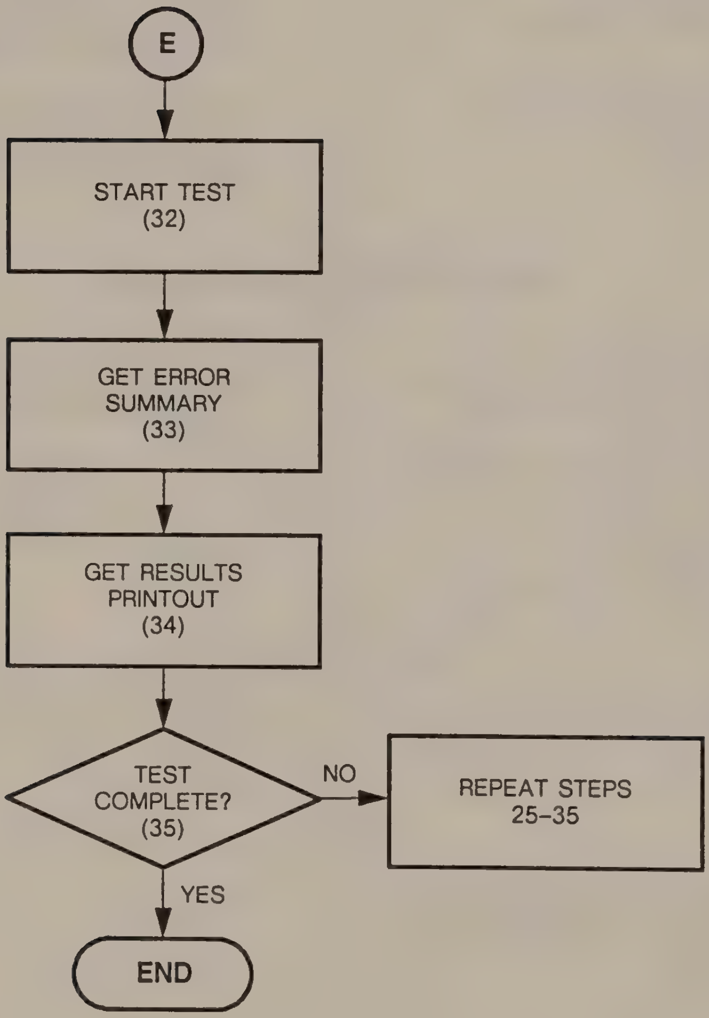
24. Connect a cable between **DS1 TX** and a DS1 input to the cross-connect frame. Connect cable between DS3 output of cross-connect frame and **DS3 RX** input.	24. Connect a cable between DS1 TX and a DS1 input to the cross-connect frame. Connect cable between DS3 output of cross-connect frame and DS3 RX input.
25. Verify the network is ready for testing. Look at the **Status** LEDs. The red **LOS** and **OOF** LEDs under **DS3** should be OFF. If the **LOS** or **OOF** LEDs under **DS3** are ON – • check the cable connections between the test set and the network • check the test set up • check the network for improper configuration	25. Verify the network is ready for testing. Check receiver status: (example: enter STATUS DS3-RX). The Status information should indicate LOS = no, OOF = no. If LOS or OOF are active – • check the cable connections between the test set and network • check the test set up • check the network for improper configuration
26. Find DS1 data in multiplexed DS3 data. Press **DMUX** key. Move ■ to **DS3 drops DS1** field. • use ▶ to enter the data field. • use ▲/▼ keys to select DS1 channel number. • Press **ENTER**. Result – the LCD displays the demultiplexed channel number and the **frame** and **pattern** of the demultiplexed channel.	26. Find DS1 data in the multiplexed DS3 data. If the DS1 channel number (chnl#) is known, (enter DMUX DS3-RX chnl#).
27.If you do not know the DS1 channel number, scan through the channels until the **frame** and **patt** status on the right side of the LCD show continuity is established with the transmitter (**frame** = ESF, and **patt** = **prbs**). Result – the LCD displays the channel number, **frame** and **patt**.	27. If you do not know the DS1 channel number, scan through the channels with the following: (example: enter DMUX DS3-RX # STATUS DS1-RX) When continuity is established, the status mode and pattern fields (upper right) should indicate ESF and PRBS-20.


D
RESET
SIGNALING
(29)
SET TEST TYPE
AND DURATION
(30)
DISPLAY DS3/DS1 BERTS
ERROR SUMMARY
(31)
(FRONT PANEL ONLY)
E

Front Panel Operation	Controller Operation
28. To guarantee detection of correct channel has been detected, insert a yellow signal in the transmitted esf data. Press **XMTR**. Move ■ to **DS1 BERTS** and press **ENTER**. Move the ■ over to **Signaling** field, then to **yellow**. Result – a ■ is next to yellow. The **DS1 PATT LOSS** LED lights.	28. To guarantee detection of correct channel, insert a yellow signal in the transmitted esf data: (example: enter SIGNALING DS1–TX YELLOW). If you have the correct channel the DS1 Status Report will show that a yellow signal is detected. To check show that a yellow signal has been detected. To check the DS1 Status:(example: enter STATUS DS1–RX).
29.After you verify the channel selection, set **Signaling** mode to **off**.	29. After you verify the channel selection, turn yellow signal off: (example: enter SIGNALING DS1–TX OFF).

START THE NETWORK TEST

30. Set test type and duration by pressing **Test TIME** key. Move ■ to select **Test type** (example: **single**). Move ■ to **Duration** field – • press ▶ to enter the Duration value field. • Use ▶/◀ keys to access digits. • Use ▲/▼ keys to set digits. • Press **ENTER** to set value. Result – The **page Duration** field shows the test duration.	30. Set the test type and duration (example: enter TEST–TYPE SINGLE and example: enter TIMER xx:yy:zz where: xx = hours yy = minutes zz = seconds
Optional – Use ■ and ENTER to set current date and time on the **page**.	Optional – Set current date and time: (example: enter TIME xx:yy:zz) (example: enter DATE aa/bb) where: aa = month bb = date
31. Press **SUMMARY** in the **Results** section. Result – The LCD shows a DS3/DS1 BERTS error summary page.	


E
START TEST
(32)
GET ERROR
SUMMARY
(33)
GET RESULTS
PRINTOUT
(34)
TEST
COMPLETE?
(35)
NO
REPEAT STEPS
25–35
YES
END

Front Panel Operation	Controller Operation
32. Once the network configuration is established, start the test by pressing the **RUN** key.	32. Once the network configuration is established, start the test: (example: enter RUN).

EXAMINE THE NETWORK TEST RESULTS

Front Panel Operation	Controller Operation
33. At the conclusion of the test, the display shows the error seconds of the completed test. You can find other error measurements by scrolling through the **pages** under the DS3/DS1 Measurements Results key. Press the key until both LEDs are ON. Use the ▲/▼ and ▶/◀ keys to look at the available DS3 and DS1 measurements.	33. At both the start and finish of the test, the test set provides a results report to the controller. A change in the operational status (LOS, OOF, BLUE, YELLOW, etc.) during the test also generates a results report. To see results of all error measurements: (example: enter RESULTS DS3-RX ALL) and (example: enter RESULTS DS1-RX ALL).
34. At any time, you can get a results pressing the SHIFT pushbutton and then pressing the PRINT key.	34. At any time, you can initiate printout by a report output on the printer port: (enter PRINT DS3-RX and enter PRINT DS1-RX).
35. When testing is complete and results evaluated, select the next DS1 channel for test by connecting a cable between DS1 TX and appropriate DS1 input, and repeating steps 25-35.	35. When testing is complete and results evaluated, select the next DS1 channel for test by connecting a cable between DS1 TX and appropriate DS1 input, and repeating steps 25-35.

IN-SERVICE TESTS

In-service testing is only performed on an end-to-end test configuration. The primary difference between out-of-service and in-service tests is that with in-service test the Bit Error Rate Transmitter is not used and the Bit Error Rate Receiver cannot perform a bit-by-bit comparison on the payload bits.

In the in-service test mode, the error measurements which are available include:

- DS3 – bipolar violations, framing bit errors, parity bit errors, C-bit errors, and in the C-Bit Parity Frame Format, C-parity errors and far end block errors.
- DS1 – bipolar violations, framing bit errors and in Extended Superframe Format, CRC6 errors

The same error measurements which are available in an in-service test mode are also available in an out-of-service test mode. Payload errors are a better indication of direct error activity, while overhead errors typically are a prediction of payload errors.

Error measurements are categorized into a number of classifications. These categories include:

Total Errors:	Total number of errors during a test.
Error Seconds:	Any second with one or more error events.
Threshold Error Seconds:	Any second in which a user defined error threshold has been violated.
Bit Error Rate:	A ratio of total number of bits in error divided by the total number of potential bit errors.
% Errored Seconds:	Total number of error seconds divided by the total number of test seconds, times 100.
% Error Free Seconds:	One minus % errored seconds.

DS3 LIVE TRAFFIC MONITOR

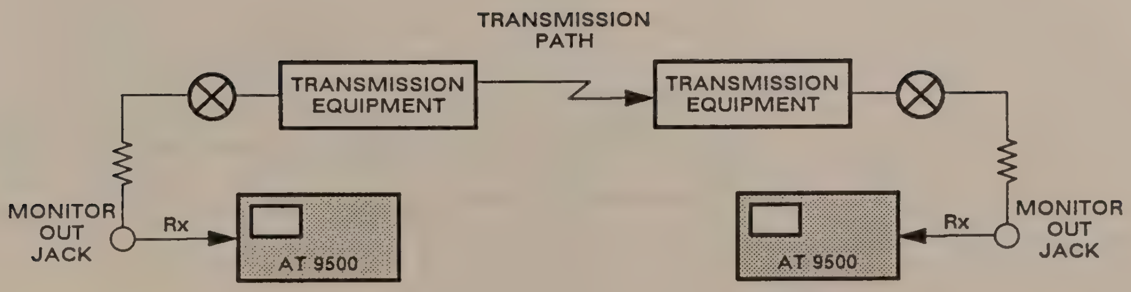
A DS3 Live Traffic Monitor test is an in-service test that checks the overhead bits of a DS3 digital network. Use this test to identify the possible sources of the problem while your customer still uses the lines.

The live traffic input drives the receiver side of the test set and you can monitor several signal parameters with the test set in this mode. Among the tests which can be performed include framing, coding and pattern checks. Prior to this test you should:

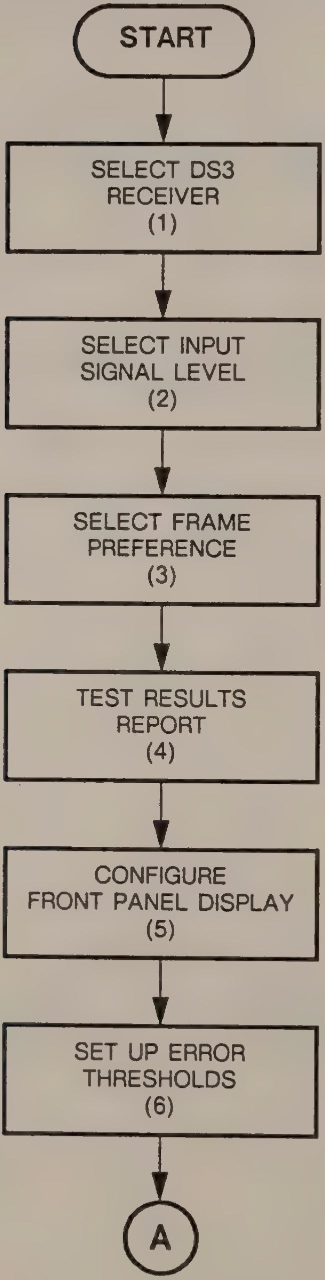
- Read the first three Chapters and Basic Applications
- Watch the training video.
- Get the necessary cables to connect to the network. See the following figure since this is an in-service test.
- Decide between front panel or controller operation of the test.

During the DS3 Live Traffic Monitor Test you will do the following:

- Set up the DS3 receiver.
- Run the test.
- Examine the results.

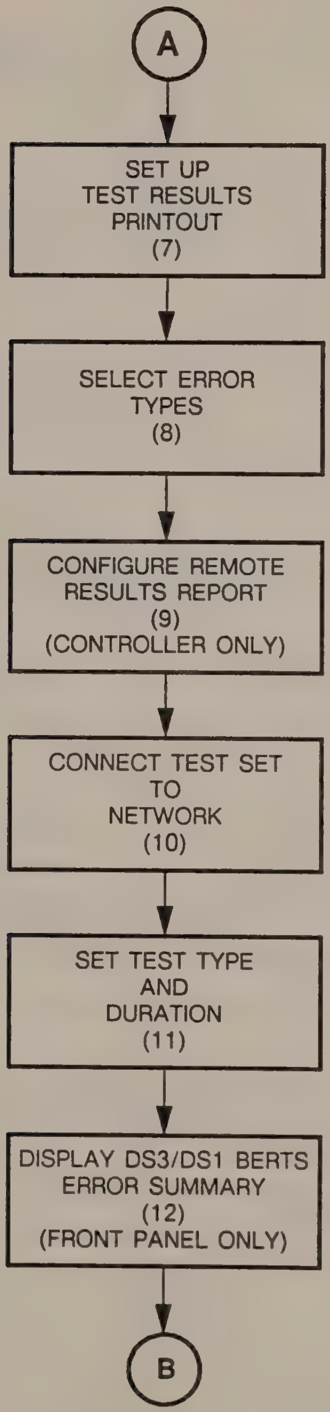


In-Service End-to-End Error Rate Test


START
SELECT DS3 RECEIVER (1)
SELECT INPUT SIGNAL LEVEL (2)
SELECT FRAME PREFERENCE (3)
TEST RESULTS REPORT (4)
CONFIGURE FRONT PANEL DISPLAY (5)
SET UP ERROR THRESHOLDS (6)
A

SETUP DS3 RECEIVER FUNCTION

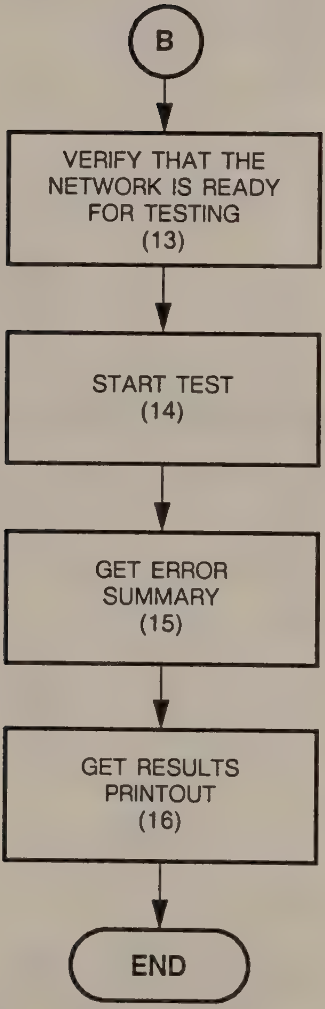
Front Panel Operation	Controller Operation
1. Press **RCVR/THRU** key to set up the receiver. Move ■ to select **DS3 BERTS** and press **ENTER**. Result – The LCD shows the DS3 BERTS RCVR SETUP **page**.	1. Address DS3 receiver function: (enter ADDR DS3–RX).
2. Select input signal level. Move ■ to **Level** fields (example: **dsx/low**). Result – a ■ is next to **dsx/low**.	2. Select input signal level: (example: enter LEVEL DSX).
3. Select **Frame preference** for auto framing algorithm. Move ■ to the **Frame preference** fields (example: **m13**). Result – a ■ is next to **m13**.	3. Select frame preference for auto framing algorithm: (example: enter PREF M13).
4. Select the mode of the test results report. Move ■ to **Report** fields (example: **events**). Result – a ■ is next to **events**.	4. Select mode of the test results Report: (example: enter REPORT PRINTER EVENTS).
5. Set up Front Panel display. Move the ■ to **Display** field, then to the **Display error results** field (example: **all**). Result – a ■ is next to **all**.	5. Set up Front Panel display: (example: enter SET–DISPLAY ALL).
6. Set up error thresholds. Move ■ to **Thresh** field, then to **Program** field to select the error type. To set the thresholds – • move the ■ to **Program** (example: **fbit**), • move ■ to **Dribbling**, • press ▶ to move ■ to the threshold value field. • Use ▶/◀ keys to get to digits. • Use ▲/▼ keys to set digits. • Press **ENTER** to set value. Repeat this procedure for **Bursty** and **Severely** threshold values and for error type **Program** (**parity**). Result – LCD shows the error thresholds.	6. Setup the error thresholds. Start with the F–bit error threshold: (example: enter THRES–F 1,2,45). Set the parity error thresholds: (example: enter THRES–P 1,2,45).


A
SET UP TEST RESULTS PRINTOUT (7)
SELECT ERROR TYPES (8)
CONFIGURE REMOTE RESULTS REPORT (9) (CONTROLLER ONLY)
CONNECT TEST SET TO NETWORK (10)
SET TEST TYPE AND DURATION (11)
DISPLAY DS3/DS1 BERTS ERROR SUMMARY (12) (FRONT PANEL ONLY)
B

Front Panel Operation	Controller Operation
7. Set up Test Results printout (optional). Move ■ to **Print** field, then to **Printout test results** field (example: **part**). Result – a ■ is next to **part**.	7. Set up the Test Results Printout (optional). Select the RS-232 port for printer output: (example: enter PRINT-DEV COM2)
8. Move the ■ to select error types. Use the ▲/▼ keys to access the error types. Press **ENTER** to select error types. When you select an error type, a ■ appears next to the error type. (example: **fbit, parity, cbit/p, febe**). Select error measurements (example: **total, es, ber**). Result – a ■ is next to **part, fbit, parity, cbit/p, febe,** and **total, es, ber**.	8. Select Results printout format: (enter SET-RESULTS FBIT PAR ERRS STAT).
	9. Set up Remote Results Report. Select mode for Remote Results: (example: enter REPORT REMOTE EVENTS).

START THE NETWORK TEST

10. Connect AT 9500 to the network. Connect a cable from the cross-connect monitor outjack to the **DS3 RX** input.	10. Connect AT 9500 to the network. Connect a cable from the cross-connect monitor outjack to the DS3 RX input.
11. Set test type and duration by pressing **Test TIME** key. Move ■ to select **Test** type (example: single). Move ■ to **Duration** field – • press ▶ to enter the **Duration** value field. • Use ▶/◀ keys to access digits. • Use ▲/▼ keys to set digits. • Press **ENTER** to set value. Result – The **page Duration** field shows the test duration.	11. Set the test type and duration (example: enter TEST-TYPE SINGLE and example: enter TIMER xx:yy:zz where: xx = hours yy = minutes zz = seconds
Optional – Use ■ and ENTER to set current date and time on the **page**.	Optional – Set current date and time: (example: enter TIME xx:yy:zz) (example: enter DATE aa/bb) where: aa = month bb = day
12. Press **SUMMARY** in the **Results** section of the front panel. Result – The screen changes to show a DS3/DS1 BERTS error summary **page**.	


B
VERIFY THAT THE NETWORK IS READY FOR TESTING (13)
START TEST (14)
GET ERROR SUMMARY (15)
GET RESULTS PRINTOUT (16)
END

Front Panel Operation	Controller Operation
13. Verify that the network is ready for testing. Look at the **DS3 Status** LEDs. The red **LOS** and **OOF** LEDs under **DS3** should be OFF. If the **LOS** or **OOF** red LEDs under **DS3** are ON – • check the cable connections between the test set and the network • check the test set setup • check the network for improper configuration.	13. Verify that the network is ready for testing. Check Receiver Status (example: enter STATUS). The current Status information should indicate LOS = no, OOF = no. If LOS or OOF are active – • check the cable connections between the test set and the network • check the test set setup • check the network for improper configuration.
14. Once the network configuration is established, start the test: (press **RUN**).	14. Once the network configuration is established, start the test: (enter RUN).

EXAMINE THE MONITOR TEST RESULTS

15. At the end of the test, the screen shows the error seconds Summary of the completed test. You can find other error measurements by scrolling through the pages under the **DS3/DS1 MEASUREMENTS** key. Press the key until the **DS3 LED** lights, and then use the ▲/▼ keys to get DS3 measurements.	15. At both the start and finish of the test, the AT 9500 provides a Results report printout to the remote controller user. A change in the operating status (LOS, OOF, PAT LOSS, BLUE, etc.) during the test also causes a Results report to be generated.
16. At any time, you can get a results printout by the pressing the **SHIFT** plus **PRINT** key.	16. At any time, you can initiate a report output on the printer port: (enter PRINT DS3-RX).

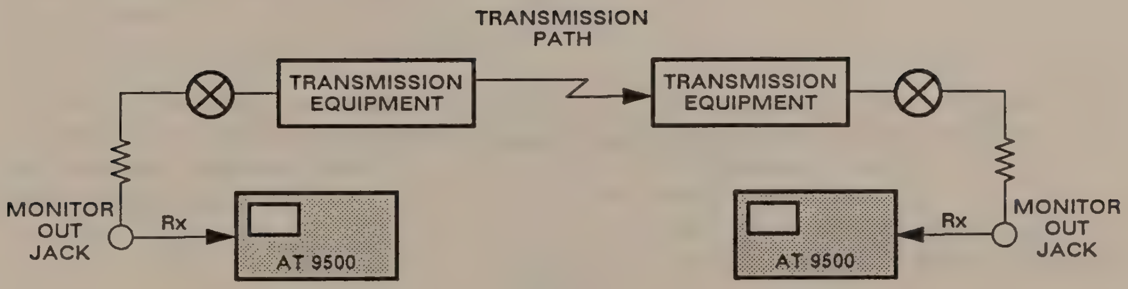
DS1 LIVE TRAFFIC MONITOR

A DS1 Live Traffic Monitor test is an in-service test that checks the overhead bit status of a DS1 digital network. Use this test to identify the possible sources of the problem while your customer still uses the line. The live traffic input drives the receiver side of the test set and you can monitor several signal parameters while the test set is in this mode. Among the tests which you can perform include framing, coding and pattern checks. Prior to this test you should:

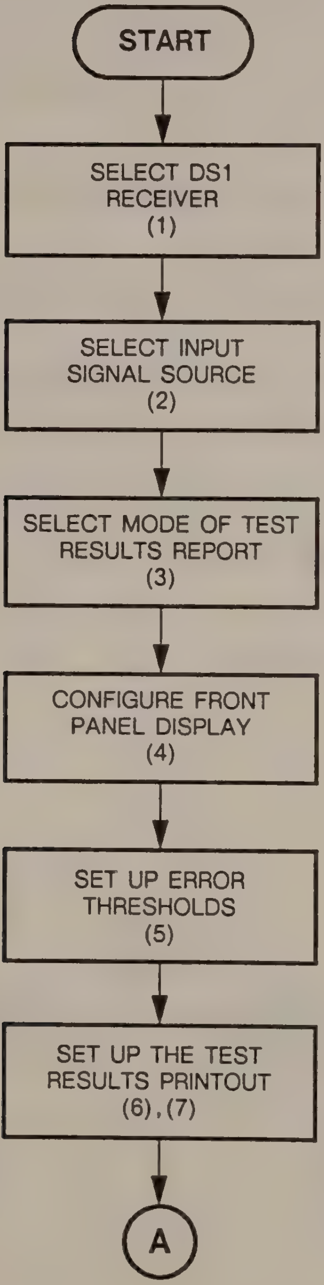
- Read the first three Chapters and Basic Applications.
- Watch the training video.
- Get the necessary cables to connect to the network. See the following figure since this is an in-service test.
- Decide between front panel or controller operation of the test.
- Review the Conventions described at the beginning of Advanced Applications.

During the DS1 Live Traffic Monitor Test you will do the following:

- Set up the DS1 receiver.
- Run the test.
- Examine the results.

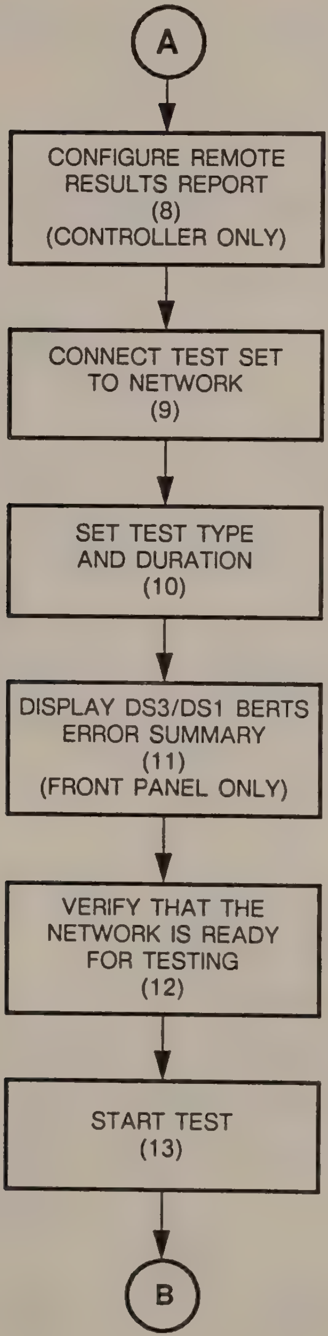


In-Service End-to-End Error Rate Test


START
SELECT DS1 RECEIVER (1)
SELECT INPUT SIGNAL SOURCE (2)
SELECT MODE OF TEST RESULTS REPORT (3)
CONFIGURE FRONT PANEL DISPLAY (4)
SET UP ERROR THRESHOLDS (5)
SET UP THE TEST RESULTS PRINTOUT (6), (7)
A

SETUP DS1 RECEIVER FUNCTION

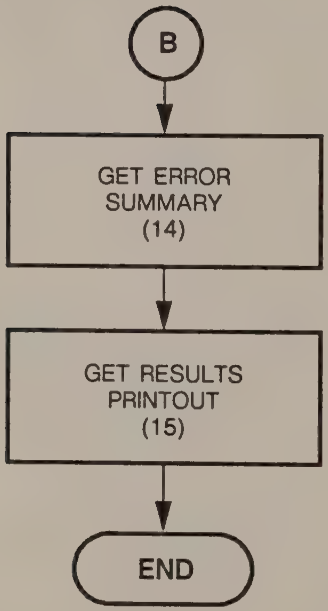
Front Panel Operation	Controller Operation
1. Select front panel **RCVR/THRU** key to set up the test set receiver. Move ■ to **DS1 BERTS** and press **ENTER**. Result – The LCD shows the DS1 BERTS RCVR SET UP page.	1. Address DS1 receiver function: (enter ADDR DS1–RX).
2. Select DS1 input source. Move ■ to **Input source** fields (example:**external**). Result – a ■ is next to **external**.	2. Select DS1 input source: (example: enter INPUT EXT).
3. Select the mode of the test results report. Move ■ to **Report** field (example: **errs/sec**). Result – a ■ is next to **errs/sec**.	3. Select mode of the test results Report: (example: enter REPORT PRINTER ERR–SEC).
4. Set up Front Panel display.Move the ■ to **Display** field, then to the **Display error results** field (example: **all**). Result – a ■ is next to **all**.	4. Set up Front Panel display: (example: enter SET–DISPLAY ALL).
5. Set up error thresholds. Move ■ to **Thresh** field,then to **Program** field to select the error type. To set the thresholds – • move the ■ to **Program** (example: **fbit**), • move ■ to **Dribbling**, • press ▶ to move ■ to the threshold value field. • Use ▶/◀ keys to get to digits. • Use ▲/▼ keys to set digits. • Press **ENTER** to set value. Repeat this procedure for **Bursty** and **Severely** threshold values and for error type **Program** (crc6). Result – the LCD shows the error thresholds.	5. Setup the error thresholds. Start with F–bit error thresholds: (example: enter THRES–F 1,2,1536) Set the parity error thresholds: (example: enter THRES–C 1,2,1536).
6. Set up Test Results printout (optional). Move ■ to **Print** field, then to **Printout test results** field (example: **part**). Result – a ■ is next to **part**.	6. Set up the Test Results Printout (optional). Select the RS–232 port for printer output: (example: enter PRINT–DEV COM2) Select Results printout format: (example: enter SET RESULTS PART).
7. Move the ■ to select error types. Use the ▲/▼ keys to access the error types. Press **ENTER** to select error types. When you select an error type, a ■ appears next to the error type. (example: **fbit, crc6**). Select error measurements (example: **total, es, ber**)	7. Select Results printout format: (enter SET–RESULTS FBIT CRC6 ERRS STAT).


A
CONFIGURE REMOTE RESULTS REPORT (8) (CONTROLLER ONLY)
CONNECT TEST SET TO NETWORK (9)
SET TEST TYPE AND DURATION (10)
DISPLAY DS3/DS1 BERTS ERROR SUMMARY (11) (FRONT PANEL ONLY)
VERIFY THAT THE NETWORK IS READY FOR TESTING (12)
START TEST (13)
B

Front Panel Operation	**Controller Operation**
	8. Set up Remote Results Report. Select mode for Remote Results: (example: enter REPORT REMOTE EVENTS).

START THE MONITOR TEST

Front Panel Operation	**Controller Operation**
9. Connect AT 9500 to the network by connecting a cable from the cross-connect monitor outjack to the **DS1 RX** input.	9. Connect AT 9500 to the network. Connect a cable from the cross-connect monitor outjack to the **DS1 RX** input.
10. Set test type and duration by pressing **Test TIME** key. Move ■ to select Test type (example: **single**). Move ■ to **Duration** field – • press ▶ to enter the **Duration** value field. • Use ▶/◀ keys to access digits. • Use ▲/▼ keys to set digits. • Press **ENTER** to set value. Result – The **page Duration** field shows the test duration.	10. Set the test type and duration (example: enter TEST–TYPE SINGLE and example: enter TIMER xx:yy:zz where: xx = hours yy = minutes zz = seconds
Optional – Use ■ and ENTER to set current date and time on the **page**.	Optional – Set current date and time: (example: enter TIME xx:yy:zz) (example: enter DATE aa/bb) where: aa = month bb = date
11. Press **SUMMARY** in the **Results** section of the front panel. Result – The screen changes to show a DS3/DS1 BERTS error summary **page**.	
12. Verify that the network is ready for testing. Look at the **DS1 Status** LEDs. The red **LOS** and **OOF** LEDs under **DS3** should be OFF. If the **LOS** or **OOF** red LEDs under **DS1** are ON – • check the cable connections between the test set and the network • check the test set setup • check the network for improper configuration.	12. Verify that the network is ready for testing. Check Receiver Status (example: enter STATUS). The current status information should indicate: Signal Loss = no Frame Loss = no • check the cable connections between the test set and the network • check the test set setup • check the network for improper configuration.
13. Once the network configuration is established, start the test by pressing **RUN**.	13. Once the network configuration is established, start the test: (enter RUN).


B
GET ERROR SUMMARY (14)
GET RESULTS PRINTOUT (15)
END

EXAMINE THE MONITOR TEST RESULTS

Front Panel Operation

14. At the end of the test, the screen shows the error seconds Summary of the completed test. You can find other error measurements by scrolling through the **pages** under the **DS3/DS1 MEASUREMENTS** key. Press the key until the **DS1** LED lights, and then use the ▲/▼ keys to get DS1 measurements.

15. At any time, you can get a results printout by the pressing the **SHIFT** plus **PRINT** key.

Controller Operation

14. At both the start and finish of the test, the AT 9500 provides a Results report printout to the remote controller user. A change in the operating status (LOS, OOF, PAT LOSS, A1S, etc.) during the test also causes a Results report to be generated.

15. At any time, you can initiate a report output on the printer port: (enter PRINT DS1-RX).

DS3/DS1 LIVE TRAFFIC MONITOR

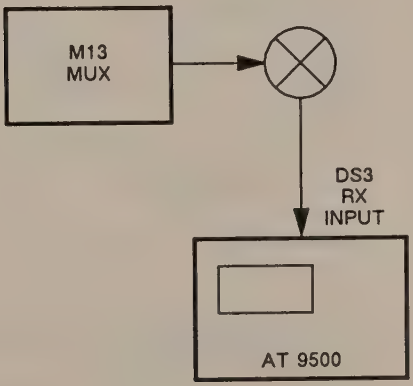
A DS3/DS1 Live Traffic Monitor tests a piece of equipment which multiplexes DS1s into a DS3 signal. The test examines the overhead bits in a live traffic DS1 signal which is demultiplexed from a DS3 signal. Use the test set receiver to analyze the DS1 signal extracted from the DS3. Because the test monitors live traffic pattern, data pattern (bit) errors cannot be measured.

The live traffic drives the receiver side of the test set. Prior to this test you should:

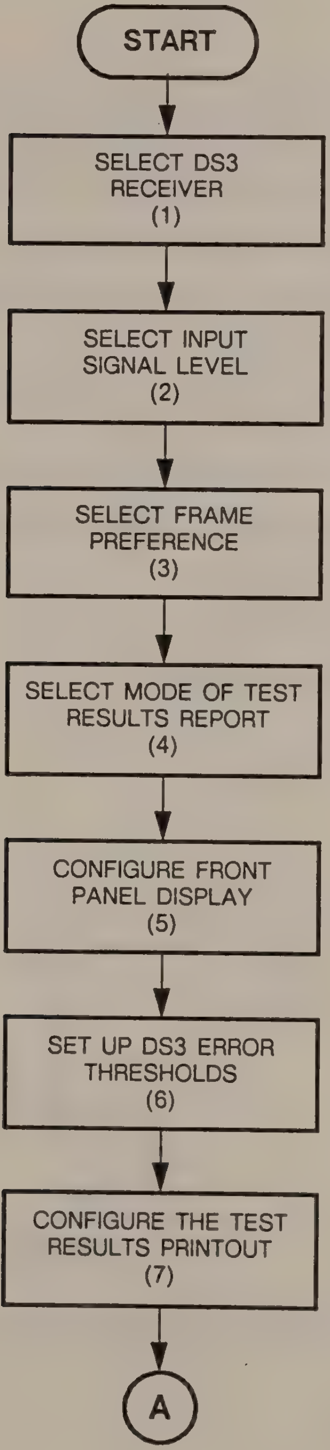
- Read the first three Chapters and Basic Applications.
- Watch the training video.
- Get the necessary cables to connect to the network. See the following figure since this is an in–service test.
- Decide between front panel or controller operation of the test.

During the DS3/DS1 Live Traffic Monitor Test you will do the following:

- Set up the DS3 receiver.
- Set up the DS1 receiver.
- Validate the test configuration.
- Run the test.
- Examine the results.

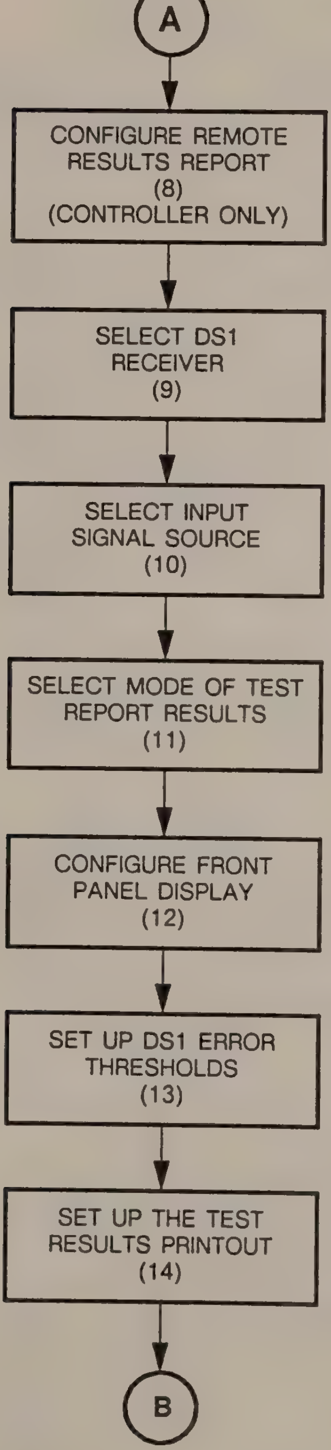


DS3/DS1 Live Traffic Monitor


START
SELECT DS3 RECEIVER (1)
SELECT INPUT SIGNAL LEVEL (2)
SELECT FRAME PREFERENCE (3)
SELECT MODE OF TEST RESULTS REPORT (4)
CONFIGURE FRONT PANEL DISPLAY (5)
SET UP DS3 ERROR THRESHOLDS (6)
CONFIGURE THE TEST RESULTS PRINTOUT (7)
A

SETUP DS3 RECEIVER FUNCTION

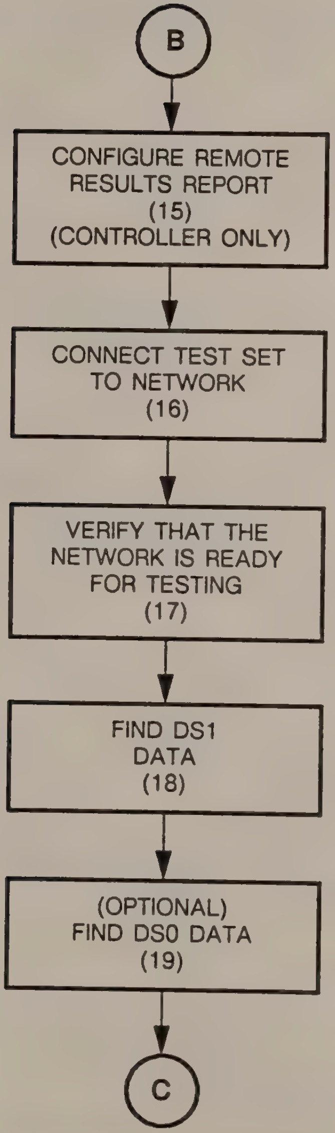
Front Panel Operation	**Controller Operation**
1. Press RCVR/THRU key to set up the DS3 receiver. Move ■ to select **DS3 BERTS** and press **ENTER**. Result – The LCD shows the DS3 BERTS RCVR SETUP page.	1. Address DS3 receiver function: (enter ADDR DS3–RX).
2. Select input signal level. Move ■ to **Level** fields (example: **dsx/low**). Result – a ■ is next to **dsx/low**.	2. Select input signal level: (example: enter LEVEL DSX).
3. Select **Frame preference** for auto framing algorithm. Move ■ to the **Frame preference** field (example: m13). Result – a ■ is next to **m13**.	3. Select frame preference for auto framing algorithm: (example: enter PREF M13).
4. Select the mode of the test results report. Move ■ to **Report** fields (example: **events**). Result – a ■ is next to **events**.	4. Select mode of the test results Report: (enter REPORT PRINTER EVENTS).
5. Set up front panel display. Move the ■ to **Display** field, then to the **Display error results** field (example: **all**). Result – a ■ is next to **all**.	5. Set up Front Panel display: (enter SET–DISPLAY ALL).
6. Set up DS3 error thresholds. Move to **Thresh** field, then to **Program** field to select the error type. To set the thresholds – • move the ■ to **Program** (example: **fbit**), • move ■ to **Dribbling**, • press ▶ to move ■ to the threshold value field. • Use ▶/◀ keys to get to digits. • Use ▲/▼ keys to set digits. • Press **ENTER** to set value. Repeat this procedure for **Bursty** and **Severely** threshold values and for error type **Program** (**parity**). Result – the LCD shows the error thresholds.	6. Setup the error thresholds. Start with F–bit error thresholds: (example: enter THRES–F 1,2,45). Then set the parity error thresholds: (example: enter THRES–P 1,2,45).
7. Set up Test Results printout (optional). Move ■ to **Print** field, then to **Printout test results** field (example: **all**). Result – a ■ is next to **all**.	7. Set up the Test Results Printout (optional). Select the RS–232 port for printer output: (example: enter PRINT–DEVCOM2). Select Results printout format: (example: enter SET RESULTS ALL).


A
CONFIGURE REMOTE RESULTS REPORT (8) (CONTROLLER ONLY)
SELECT DS1 RECEIVER (9)
SELECT INPUT SIGNAL SOURCE (10)
SELECT MODE OF TEST REPORT RESULTS (11)
CONFIGURE FRONT PANEL DISPLAY (12)
SET UP DS1 ERROR THRESHOLDS (13)
SET UP THE TEST RESULTS PRINTOUT (14)
B

Front Panel Operation	**Controller Operation**
	8. Set up Remote Results Report. Select mode for Remote Results: (enter REPORT REMOTE EVENTS).

SETUP DS1 RECEIVER FUNCTION

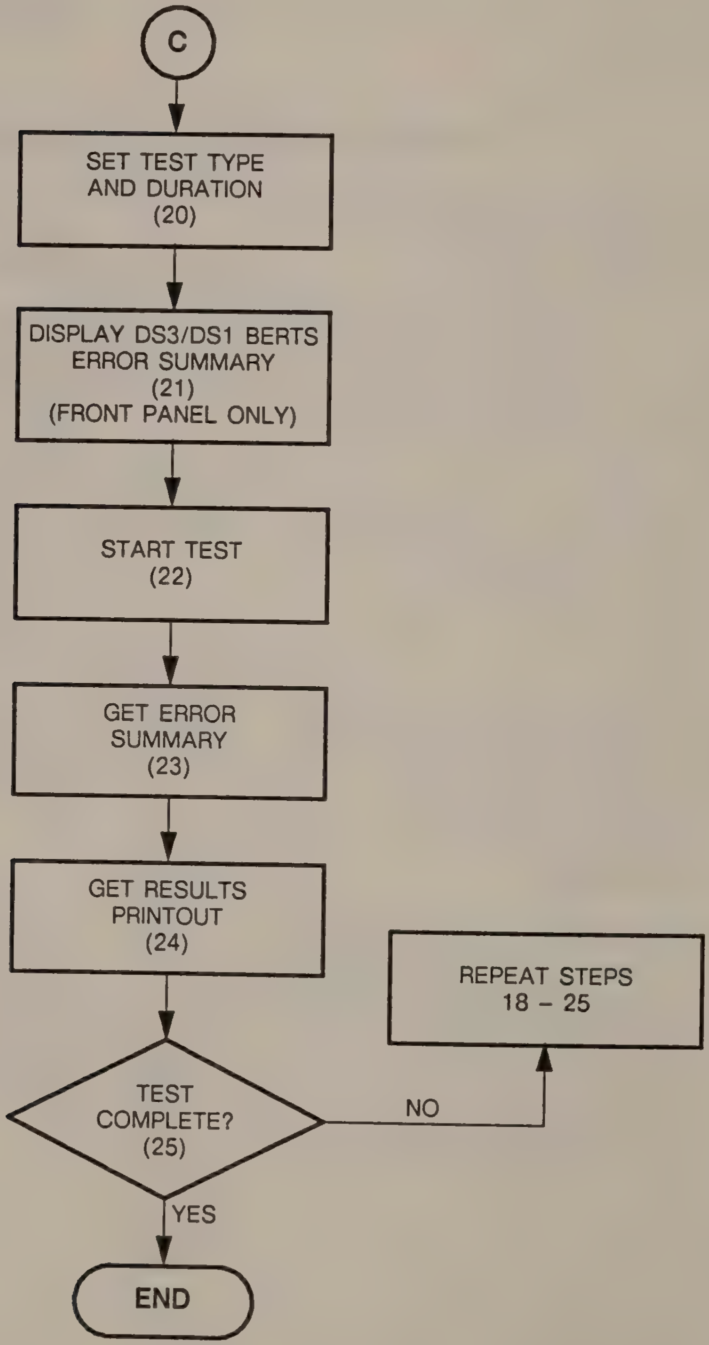
Front Panel Operation	**Controller Operation**
9. Select front panel **RCVR/THRU** key to set up the test set DS1 receiver. Move ■ to **DS1 BERTS** and press **ENTER**. Result – The LCD shows the DS1 BERTS RCVR SET UP page.	9. Address DS1 receiver function: (enter ADDR DS1–RX).
10. Select DS1 input source. Move ■ to **Input source** fields (example: **demux**). Result – a ■ is next to **demux**.	10. Select DS1 input source: (example: enter INPUT DMUX).
11. Select the mode of the test results report. Move ■ to **Report** field (example: **events**). Result – a ■ is next to **events**.	11. Select mode of the test results Report: (example: enter REPORT PRINTER EVENTS).
12. Set up Front Panel display. Move the ■ to **Display** field, then to the **Display error results** field (example: **all**). Result – a ■ is next to **all**.	12. Set up Front Panel display: (example: enter SET–DISPLAY ALL).
13. Set up DS1 error thresholds. Move ■ to **Thresh** field, then to **Program** field to select the error type. To set the thresholds – • move ■ to **Program** (example: **fbit**), • move ■ to **Dribbling**, • press ▶ to move ■ to the the threshold value field. • Use the ▶/◀ keys to get to digits. • Use ▲/▼ keys to set digits. • Press **ENTER** to set value. Repeat this procedure for **Bursty** and **Severely** threshold values and for error type **Program (crc6)**. Result – the LCD shows the error thresholds.	13. Set up the error thresholds. Start with F–bit error thresholds: (example: enter THRES–F 1,2,1536). Then set the crc6 error thresholds: (example: enter THRES–C 1,2,1536).
14. Set up Test Results printout (optional). Move ■ to **Print** field, then to **Printout test results** field (example: **all**). Result – a ■ is next to **all**.	14. Set up the Test Results Printout (optional). Select the RS–232 port for printer output: (example: enter PRINT–DEV COM2) Select Results printout format: (example: enter SET–RESULTS ALL).


B
CONFIGURE REMOTE RESULTS REPORT (15) (CONTROLLER ONLY)
CONNECT TEST SET TO NETWORK (16)
VERIFY THAT THE NETWORK IS READY FOR TESTING (17)
FIND DS1 DATA (18)
(OPTIONAL) FIND DS0 DATA (19)
C

Front Panel Operation	Controller Operation
	15. Set up Remote Results Report. Select mode for Remote Results: (example: enter REPORT REMOTE EVENTS).

VALIDATE THE TEST CONFIGURATION

Front Panel Operation	Controller Operation
16. Connect a cable between the DS3 cross-connect monitor outjack and the **DS3 RX** input.	16. Connect a cable between the DS3 cross-connect monitor outjack and the **DS3 RX** input.
17. Verify the network is ready for testing. Look at the **Status DS3** LEDs on the front panel. The red **LOS** and **OOF** LEDs under **DS3** should be OFF. If the red **LOS** or **OOF** LEDs under **DS3** are ON – • check the cable connections between the test set and the network • check the test set setup • check the network for improper configuration.	17. Verify that the network is ready for testing. Check Receiver Status: (enter STATUS DS3-RX). The current status information should indicate LOS = no, OOF = no. If LOS or OOF are active – o check the cable connections between the test set and the network o check the test set setup o check the network for improper configuration.
18. Find the DS1 data in the multiplexed DS3 data. Press **DMUX** key. Move ■ to **DS3 drops DS1** field. • use ▶ to enter the data field • use ▲/▼ keys to select DS1 channel number • press **ENTER** key.	18. Find the DS1 data in the multiplexed DS3 data. To select the DS1 channel number (chnl#): (example: enter DMUX DS1-RX ds1_chnl#).
19. Once the DS1 channel is established, you can monitor each of the 24 DS0 channels by moving ■ to **DS1 drops DS0** field: • use ▶ to enter data field • use ▲/▼ keys to pick the DS0 channels • use **VOLUME** control to adjust audio speaker output.	19. Once the DS1 channel is established, each of the 24 DS0 channels can be monitored: (example: enter DMUX DS1-RX ds0_chnl#). Note – the DS0 data is only available locally and cannot be accessed remotely.


C
SET TEST TYPE AND DURATION (20)
DISPLAY DS3/DS1 BERTS ERROR SUMMARY (21) (FRONT PANEL ONLY)
START TEST (22)
GET ERROR SUMMARY (23)
GET RESULTS PRINTOUT (24)
TEST COMPLETE? (25)
NO
REPEAT STEPS 18 – 25
YES
END

START THE NETWORK TEST

Front Panel Operation

20. Set test type and duration by pressing Test TIME key. Move ■ to select **Test** type (example: **single**). Move ■ to **Duration** field –

- press ▶ to enter the **Duration** value field.
- Use ▶/◀ keys to access digits.
- Use ▲/▼ keys to set digits.
- Press **ENTER** to set value.

Result – The **page Duration** field shows the test duration.

Optional – Use ■ and ENTER to set current date and time on the **page**.

21. Press **SUMMARY** in the **Results** section of the front panel.
Result – The screen changes to show a DS3/DS1 BERTS error summary **page**.

22. Once the network configuration is established, start the test by pressing the **RUN** key.

Controller Operation

20. Set the test type and duration (example: enter TEST-TYPE SINGLE and example: enter TIMER xx:yy:zz where:

xx = hours
yy = minutes
zz = seconds

22. Once the network configuration is established, start the test: (enter RUN).

EXAMINE THE NETWORK TEST RESULTS

23. At the conclusion of the test, the display shows the error seconds Summary of the completed test. You can see other error measurements by scrolling through the **pages** under the **Results MEASUREMENTS DS3/DS1** key. Press the key until both LEDs light. Use the ▲/▼ keys to look at available DS3 and DS1 measurements.

24. At any time, you can get a results printout by pressing **SHIFT** plus **PRINT** keys.

25. When test is complete and results evaluated, select the next DS1 channel for test by repeating steps 18–25.

23. At both the start and finish of the test, the test set provides a results report to the remote user. A change in the operational status(LOS, OOF, BLUE, YELLOW, etc.) during the test also generates a results report. To see results of all error measurements:
(example: enter RESULTS DS3–RX ALL)
(example: enter RESULTS DS1–RX ALL).

24. At any time, you can initiate a report output on the printer port (example: enter PRINT DS3–RX and example: enter PRINT DS1–RX).

25. When test is complete and results evaluated, select the next DS1 channel for for test by repeating steps 18–25.

CHAPTER 5
FRONT PANEL OPERATION – ADDITIONAL DETAILS

5.1 INTRODUCTION

This chapter describes the AT 9500 controls and indicators used to operate the test set. Also in this chapter are descriptions of the "**pages**" available for display on the front panel screen.

The front panel Setup and Results controls each divide into three sections:

Setup:	Input/Output connectors LEVEL SETUP
Results:	STATUS TEST RESULTS

Following the SETUP group of switches is a picture of each **page** the AT 9500 may display in response to SETUP commands. Each **page** includes information about the test conditions you can change on the **page**. Refer to these **pages** as necessary to devise testing variations from the Applications in Chapter 4.

Following the TEST and RESULTS switch functions are the s the AT 9500 may display in response to a Results command. Each **page** lists the available measurements. Refer to the **pages** as necessary to interpret the results of tests in the Applications chapter.

5.2 INPUT AND OUTPUT JACKS

The AT 9500 has front panel input and output jacks for DS3, DS1 and DS0 signals. Figure 5.1 highlights these jacks and Table 5.1 lists the signals available.

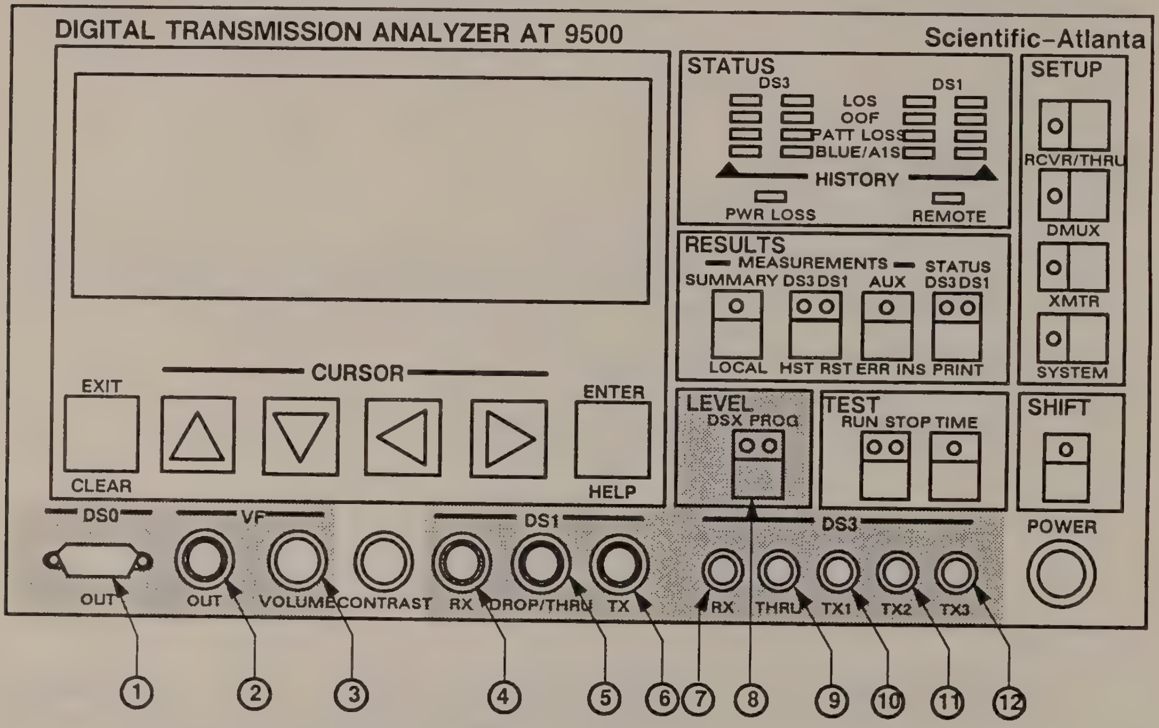


Figure 5.1. AT 9500 – Setup Switches, Indicators and Connectors

Table 5.1
Input and Output Connectors

Key	Control	Function
1	DS0 OUT	Output jack for digital outputs to an auxiliary monitor. DS0 OUT is a 9-pin connector with TTL level signals capable of driving one load at TTL level. The signal connections follow: Pin Signal 1 Ground 2 Ground 3 Ground 4 Ground 5 Ground 6 DS0 DATA (Dx) 7 DS0 CLOCK (DCLK) 8 8 kHz FRAME SYNC CLOCK (FSx) 9 Not Used
2	VF OUT	Output jack for monitoring audible DS0 traffic.
3	VOLUME	Controls audible volume output through the VF OUT jack and the speaker.
4	DS1 RX	Input jack for DS1 receiver signals.
5	DROP THRU	THRU (DS1 external signal selected): In Re-encode Mode, internal circuitry corrects BPVs (bipolar violations) in the signal received at the DS1 RX input jack. In Re-frame Mode, internal circuitry corrects BPVs, CRC6, and framing errors on the signal received at the DS1 RX input jack. DROP (DS1 Demultiplexed signal selected): In Re-encode mode, the internal circuitry encodes the DS1 signal dropped from DS3 Rx input signal. In Re-frame mode, internal circuitry corrects CRC6 and framing errors and encodes the DS1 signal dropped from DS3 Rx input signal.
6	TX	Output jack for DS1 transmitter signals.
7	DS3 RX	Input jack for DS3 receiver signals.
9	DS3 THRU	In Re-encode Mode, internal circuitry corrects BPVs in the signal received at the DS3 RX input jack. In Re-frame Mode, internal circuitry corrects BPVs, framing, and parity errors in the signal received at the DS3 RX jack.
10	TX1	Output jack for DS3 transmitter output 1.
11	TX2	Second output jack for DS3 transmitter output.
12	TX3	Third output jack for DS3 transmitter output.

5.3 LEVEL

The LEVEL section of the front panel (see Figure 5.1) has one switch with integral LEDs. The LEVEL switch allows you to select either DSX (for a digital cross-connect) or the user programmed level. Table 5.2 describes the switch and LED function.

Table 5.2
Level Controls and Indicators

Key	Control	Function
8	LEVEL	This switch sets all DS3 inputs and outputs to: • Either accept or generate the cross-connect signal level. • A special signal level with a programmable input. You can program the level in the transmitter and receiver functional setups. Integral green LEDs light to indicate the current **LEVEL** switch setting.

5.4 SETUP KEYS

The SETUP keys in Figure 5.2 have an LED indicator that lights when the selection is active. Table 5.3 explains how each key relates to the testing modes of the AT 9500. The front panel pages accessible from the SETUP keys follow the switch description.

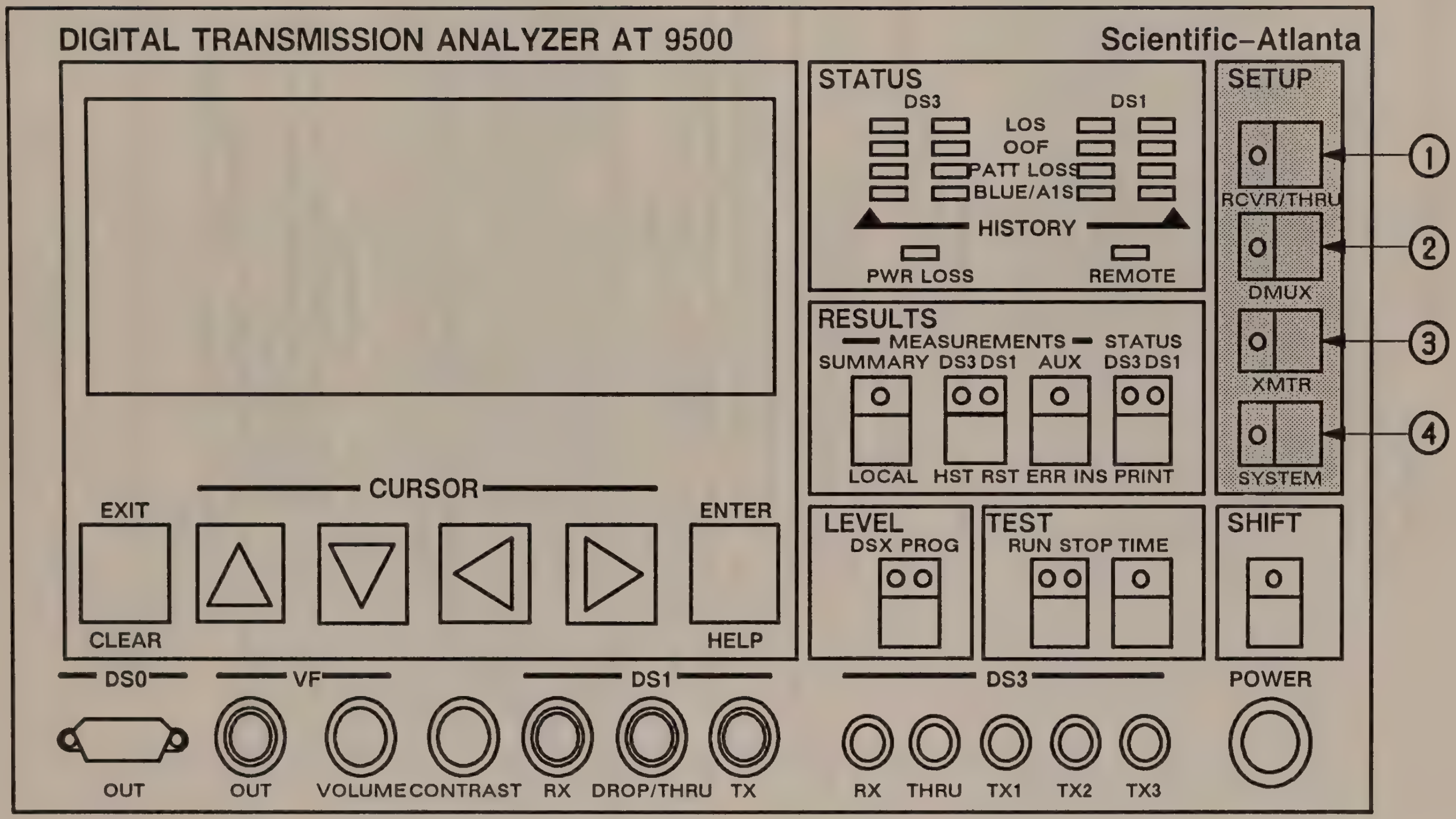


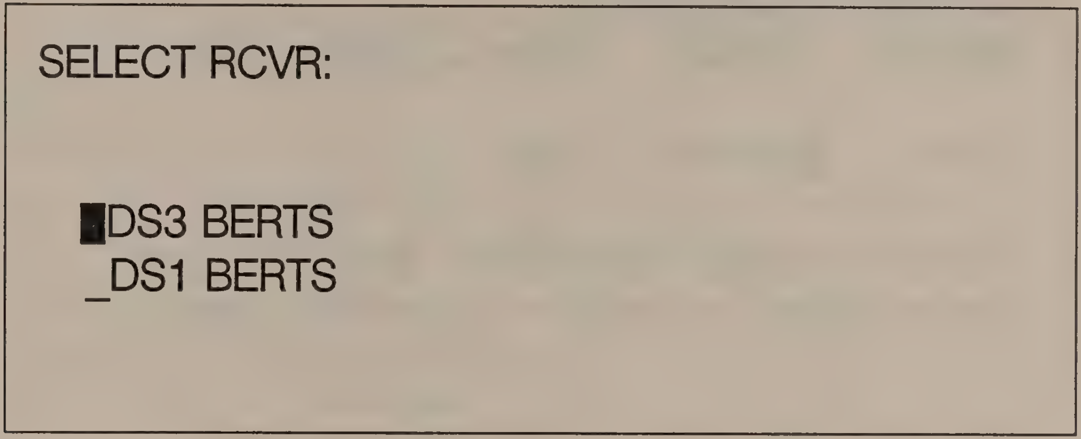
Figure 5.2. AT 9500 – Setup Switches, Indicators, and Connectors

Table 5.3
Setup Keys Function

Key	Control	Function
1	RCVR/THRU	Select the RCVR/THRU key to: ● Set up the AT 9500 screen, thresholds, and printer to provide outputs of interest. ● Select the correct input level. ● Enable the Thru Mode output and error insert rates for both DS3 and DS1 receivers. See Sections 5.4.1 through 5.4.11 for the RCVR/THRU pages.
2	DMUX	Pressing the DMUX key lets you select: ● Any 1 of the 28 DS1s in a DS3 signal. ● 1 DS0 channel out of the 24 DS0 signals composing a DS1 signal. ● DS3 Thru Mode output from the DS3 OUT connector on the front panel. ● Thru Mode or demultiplexed DS1 output at the front panel DS1 OUT jack. ● Demultiplexed DS0 outputs in digital format from the DS0 nine-pin D-connector on the front panel and in analog format from the VF OUT jack. Section 5.5 shows the DMUX page.
3	XMTR	Selecting the XMTR key lets you: ● Set up the AT 9500 DS3 or DS1 transmit functions. ● Set the framing type, code, pattern, error insertion, and special signaling functions for both DS3 and DS1 transmitters. See Sections 5.6.1 through 5.6.7 for the transmitter pages.
4	SYSTEM	The SYSTEM key allows you to: ● Store and recall regularly used test setups. ● Set up remote communication through an RS-232 or IEEE-488 bus. ● Select other system set up parameters. See Sections 5.7.1 through 5.7.5 for the SYSTEM pages.

How to Use the Receiver Pages

5.4.1 SELECT RCVR (Select Receiver)



```
SELECT RCVR:


 █DS3 BERTS
 _DS1 BERTS
```

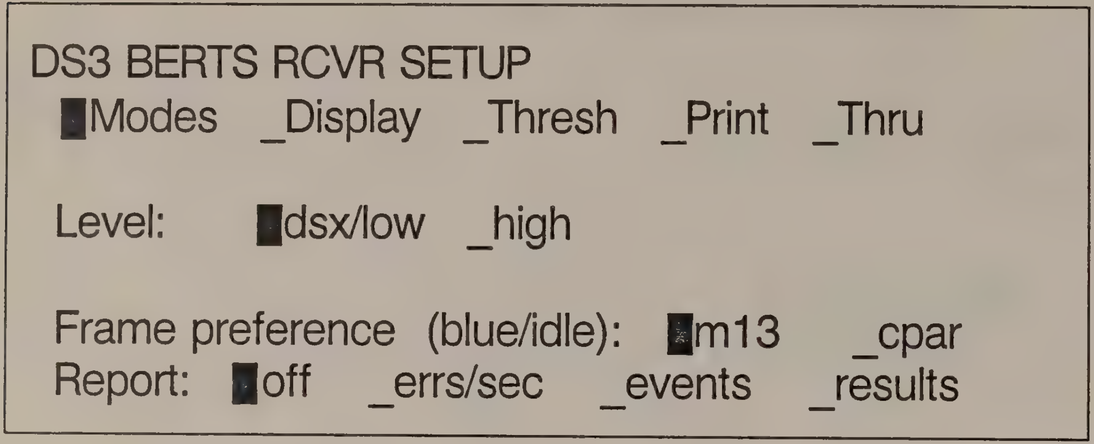
The Select Receiver **page** allows you to choose either the DS3 or DS1 receiver. Press the ▼ key to reach your selection and then press ENTER. The AT 9500 responds with the selected DS3 or DS1 receiver setup **pages**.

- Sections 5.4.2 through 5.4.6 describe the DS3 setup **pages**.
- Sections 5.4.7 through 5.4.11 describe the DS1 setup **pages**.

These sections show each setup **page** and describe the selections available for you to plan testing and troubleshooting.

- **Modes** – lets you set receiver level, framing preference and reporting for DS3. In DS1 use the Modes **page** to select input signal source and reporting.
- **Display** – allows selecting for display, either all or part of the measurements the DS1 and DS3 receivers make.
- **Thresholds** – permits setting the error detection thresholds for the DS3 and DS1 receivers.
- **Print** – selects either all or part of the signal measurements the DS3 and DS1 receivers make for printout.
- **Thru** – sets output mode and error insertion processing on the DS3 Thru signal.

5.4.2 DS3 BERTS RCVR SETUP (Modes)



```
DS3 BERTS RCVR SETUP
 ■Modes   _Display   _Thresh   _Print   _Thru

 Level:      ■dsx/low   _high

 Frame preference  (blue/idle):  ■m13    _cpar
 Report:  ■off    _errs/sec    _events    _results
```

Select the DS3 BERTS Receiver Setup (Modes) page to set the following:

- receiver level
- framing preference
- reporting.

The Level entry line allows you to set the receiver signal level that the AT 9500 detects.

Use the Frame Preference selection line to control the input framing type when the AT 9500 receives BLUE and Idle signals.

The Report line lets you select the conditions which cause the AT 9500 to print reports during tests.

To make these selections position ■ in the adjacent field and press ENTER. You can only select one entry per line on the AT 9500 display.

LEVEL

dsx/low	Sets the DS3 receiving level at dsx/low. Use this setting for: • DSX • DSX-monitor • low level inputs
high	Sets the DS3 receiving level at high. Use this setting for: • high level inputs

FRAME PREFERENCE

m13	When the AT 9500 receives a BLUE/Idle signal after a loss of frame condition, the frame type is set to M13.
cpar	When the AT 9500 receives a BLUE/Idle signal after a loss of frame condition, the frame type is set to C-parity.

REPORT

off
The AT 9500 will not report to the printer during a test. You can still get a printout by pressing the SHIFT plus PRINT keys.

results
Select **results** to cause the AT 9500 to issue a report printout at:

- the start/stop of a test
- status changes
- error occurrences

Note – you can control which error occurrences are in the printout in the PRINT **page** all/part set up line, see Section 5.4.5.

events
Select **events** to get the AT 9500 to issue a report printout at:

- the start/stop of a test
- status changes.

err/secs
Select **err/secs** (error seconds) to get a report printout at:

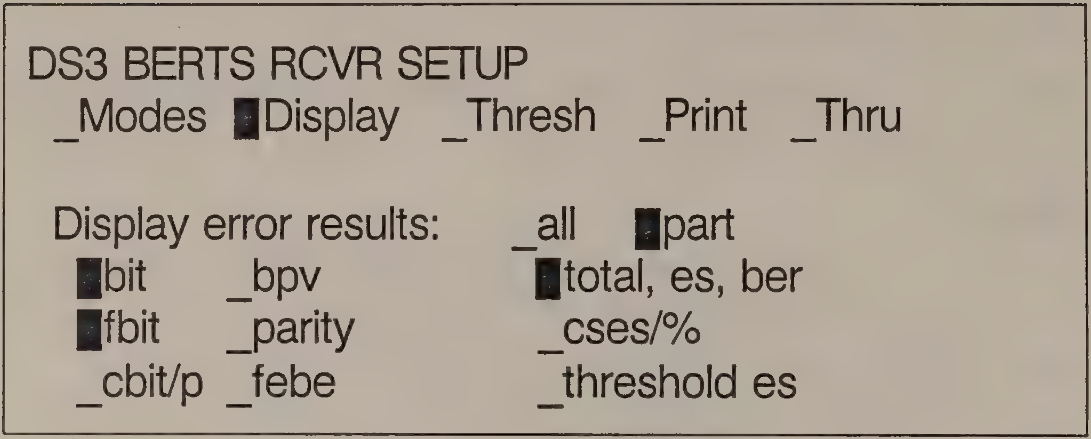
- the start/stop of test
- status changes
- error occurrences

Note – You can select which error occurrences are in the printout in the PRINT **page** all/part set up line, see Section 5.4.5.

The error seconds report will print a single line of error information for each second in which an error is detected. If the AT 9500 detects more than one error type during a second, the highest priority error type will be printed. The priority is:

bit
F-bit
parity
C-bit parity
febe
BPV

5.4.3 DS3 BERTS RCVR SETUP (Display)



```
DS3 BERTS RCVR SETUP
 _Modes ■Display  _Thresh  _Print  _Thru

 Display error results:     _all  ■part
  ■bit    _bpv               ■total, es, ber
  ■fbit   _parity            _cses/%
  _cbit/p _febe              _threshold es
```

The Display **page** lets you select the error measurements that the AT 9500 reports to the front panel display. The **Display error results** entry allows you to select **all** or **part** of the errors the test set is measuring for display on the DS3 Measurement Results **page** (see Section 5.13.3).

When you select **part**, the error types and error measurement categories appear on the bottom half of the **page**. To set up the DS3 Measurement Results **page**, position ■ in either the **all** or **part** field and press the ENTER key.

NOTE

Make sure at least one error type and one measurement category is selected.

When you select **part**, press ▼ key to get to the error types and error measurement categories. Position ■ in the field you want to measure and press the ENTER key. A ■ indicates an active selection. Repeat, until your selections are complete. The error fields marked with a ■ appear on the DS3 Measurement Results **page**.

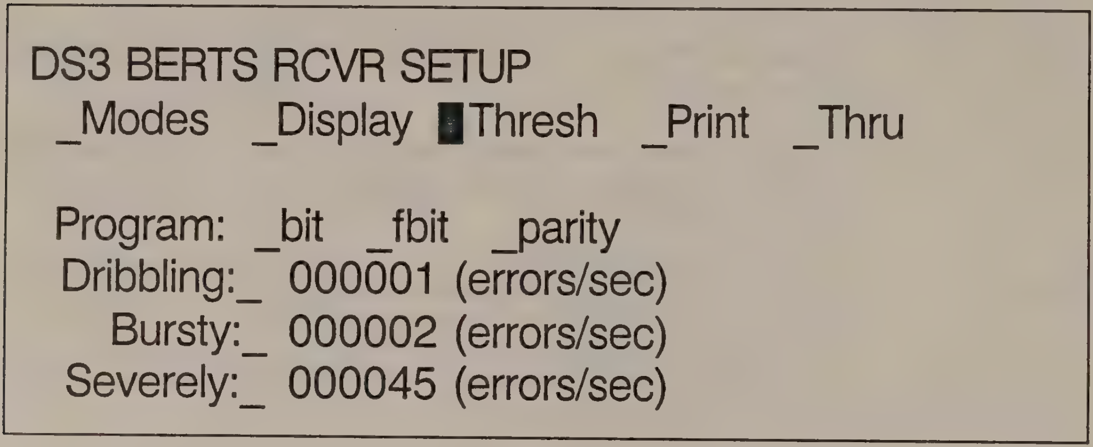
DISPLAY ERROR RESULTS

all	Displays all the DS3 measurements for the test.
part	**Part** lets you choose which error types and results the AT 9500 displays. Enter this field to display your choices and gain access to the lower three rows on the display.

ERROR TYPES AND RESULTS

bit	**Bit** errors are pattern errors detected in the received data.
bpv	Bipolar Violations (**bpv**) occur when two successive incoming data ones have the same polarity.
fbit	Framing bit (**f–bit**) errors happen when the framing bits in the incoming data stream do not follow the proper sequence (the proper sequence for an F–bit is 1001...).
parity	A **parity** error occurs when the parity bits received by the AT 9500 do not match the **parity** calculation made on the incoming data.
cbit/p	In M13 framing, a C–bit error occurs when the three C–bits in a particular subframe are not all the same. In C–bit Parity framing, C–bit parity errors happen when the C–parity bits do not match the parity calculation made on the incoming data.
febe	A Far End Block Error (**febe**) occurs in C–bit Parity framing when the three C–bits in the fourth subframe are not all ones. A **febe** indicates that C–bit parity errors were detected at the far end of the transmission link. This error type is not valid for M13 framing.
total, es, ber	Total errors (**total**), Error Seconds (**es**), and Bit Error Rate (**ber**) measurements.
cses/%	The AT 9500 will report Consecutive Severely Errored Seconds (**cses**), % Error Free Seconds and % Errored Seconds (**%**) measurements.
threshold es	The AT 9500 will report Dribbling, Bursty, and Severely errored seconds. The AT 9500 makes these measurements based on the error thresholds which are set for each error type (see Thresholds Section 5.4.4).

5.4.4 DS3 BERTS RCVR SETUP (Thresholds)



```
DS3 BERTS RCVR SETUP
 _Modes  _Display ■Thresh  _Print  _Thru

 Program:  _bit  _fbit  _parity
 Dribbling:_  000001 (errors/sec)
    Bursty:_  000002 (errors/sec)
  Severely:_  000045 (errors/sec)
```

Select the DS3 BERTS RCVR SETUP thresholds **page** to set the AT 9500 error detection thresholds. The test set sorts errors into three classes – dribbling, bursty and severely. In addition, the AT 9500 error thresholds can be set for bits, F–bits and parity. The bit thresholds apply to BPVs while the parity thresholds apply to cbit/p and FEBE error measurements. The default thresholds are shown on the display above.

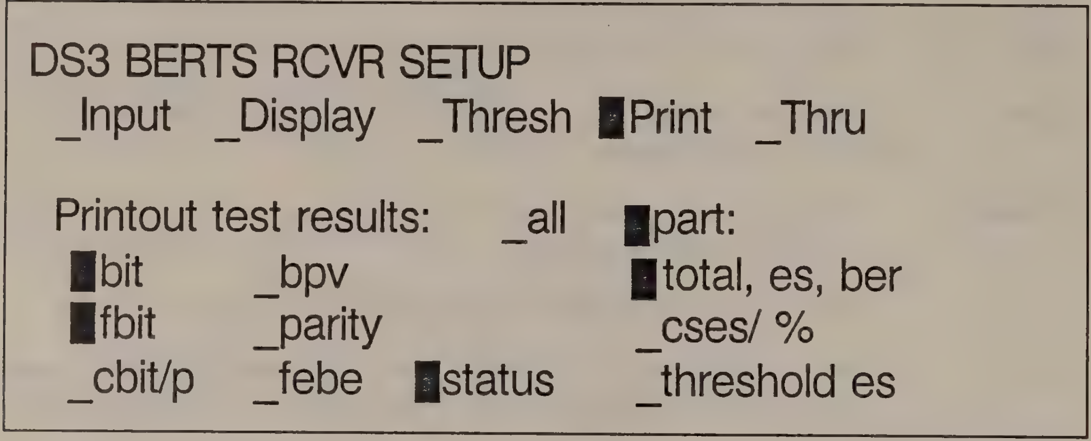
The AT 9500 increments only one of the threshold error counters per second. The AT 9500 can display threshold values as either the number of errors per second (**errors/sec**), or the Bit Error Rate (**error rate**). You can also modify the thresholds by either **error rate** or **errors/sec**. You can toggle the display (between errors/sec or error rate) by moving the cursor to the field in front of the numeric values and pressing the ENTER key.

To modify the AT 9500 threshold values select an error type (bit, F–bit or parity) and move the flashing ■ to the threshold class (dribbling, bursty or severely) you want to change. With ■ located at the left of one of the threshold class fields, you can enter the value field by pressing ▶ key. After you enter the value field, use ▶ / ◀ keys to select the digits and then use ▲ / ▼ keys to increase or decrease the value of each digit. When the threshold value is set, press ◀ key to exit the field and the ENTER key to save the new threshold value.

PROGRAM

bit	Select **bit** to change the thresholds for the AT 9500 Bit and BPV Error Rates.
fbit	Select **fbit** to change the thresholds for the test set F-bit error rates.
parity	Select this field to change the thresholds for the test set parity bits (cbit/p and FEBE) measurements.
dribbling	Dribbling error threshold sets the low error threshold. The AT 9500 counts a second as **dribbling** when: dribbling error threshold $\leq$ errors < bursty error threshold
bursty	The AT 9500 uses the Bursty error threshold as the mid-range error threshold (i.e., a small burst of errors). The AT 9500 counts the second as **bursty** when: bursty error threshold $\leq$ # errors < severely error threshold
severely	The AT 9500 counts a second as **severely** when: # errors $\geq$ severely error threshold The AT 9500 also increments the severely error second counter after detecting a loss of signal.

5.4.5 DS3 BERTS RCVR SETUP (Print)



```
DS3 BERTS RCVR SETUP
 _Input   _Display   _Thresh ■Print   _Thru

 Printout test results:     _all   ■part:
  ■bit        _bpv                  ■total, es, ber
  ■fbit       _parity               _cses/ %
  _cbit/p     _febe    ■status      _threshold es
```

The Print page lets you select the types of error measurements that the AT 9500 reports to the optional printer. The **Printout test results** entry lets you set up the printout to include **all** or **part** of the types of errors and measurements the AT 9500 can make. When you select **part**, the error types and error measurement categories appear on the bottom half of the page.

NOTE

Make sure at least one error type and one measurement category is selected.

To set up the DS3 printout, position ■ in the desired (**all** or **part**) field and press the ENTER key. When you select **part**, press ▼ key to select the error types and error measurement categories you need to measure. Repeat, until selections are complete. The error fields with a ■ will be on printouts.

PRINTOUT TEST RESULTS

all	The AT 9500 prints out all the DS3 measurement results for the test.
part	**part** lets you choose which error types and results the AT 9500 will printout. Enter this field to display the available choices. Press ▼ key to get to the selections.
bit	**bit** errors are pattern errors detected in the received data.

bpv	Bipolar Violations (**bpv**) occur when two successive incoming data ones have the same polarity.
total, es, ber	**Total** (total errors), **es** (error seconds), and **ber** (Bit Error Rate) measurements.
fbit	Framing bit errors (**fbit**) occur when the framing bits in the incoming data stream do not follow the proper sequence. The normal F–bit pattern is 1001....
parity	A **parity** error occurs when the received parity bits do not match the parity calculation made on the incoming data.
cses/%	Consecutive Severely Errored Seconds (**cses**), Percent Error Free Seconds and Percent Errored Seconds (**%**) measurements.
cbit/p	In M13 framing, a C–bit error occurs when the three C–bits in a particular subframe are not all the same. In C–bit Parity framing, C–bit parity errors occur when the c–parity bits do not match the parity calculation made on the incoming data.
febe	A Far End Block Error (**febe**) occurs when the three C–bits in the fourth subframe are not all ones. This indicates that C–bit parity errors were detected at the far end of the transmission link. This error type is not valid in M13 framing.
threshold es	Dribbling, bursty, and severely errored seconds. The AT 9500 makes these measurements based on the error thresholds which are set for each error type (selected in the Threshold **page**, Section 5.4.4).
status	Includes status information in the DS3 error printout.

5.4.6 DS3 BERTS RCVR SETUP (Thru)

```
DS3 BERTS RCVR SETUP
 _Modes   _Display   _Thresh   _Print █Thru

  Output: █ re-encode    _re-frame
   Errors: _off █single   _ber   _burst   _1/sf
   frame: █off   _fbit   _par
  coding: █off   _bpv   _code   _combo
```

Page 1

The four Thru Mode **pages** allow you to select output mode and error insertion processing on the DS3 THRU mode output signal. The Thru Mode **pages** also provide the capability of adding errors to the received data before it is retransmitted.

When you select re-encoded output mode, the data received at the DS3 RX input jack is re-encoded (Bipolar Violations are corrected). The corrected data are available at the DS3 THRU jack. When you select re-framed output mode, the received data are reframed (F-bits and parity errors are corrected) and re-encoded. The corrected data are available at the DS3 THRU jack.

There are four different Thru **Pages**, one for each of the error categories:

- single
- ber
- burst
- 1/sf

OUTPUT

re-encode	Selects re-encoded data mode for the DS3 THRU jack.
re-frame	Selects re-framed data mode for the DS3 THRU jack.

ERRORS

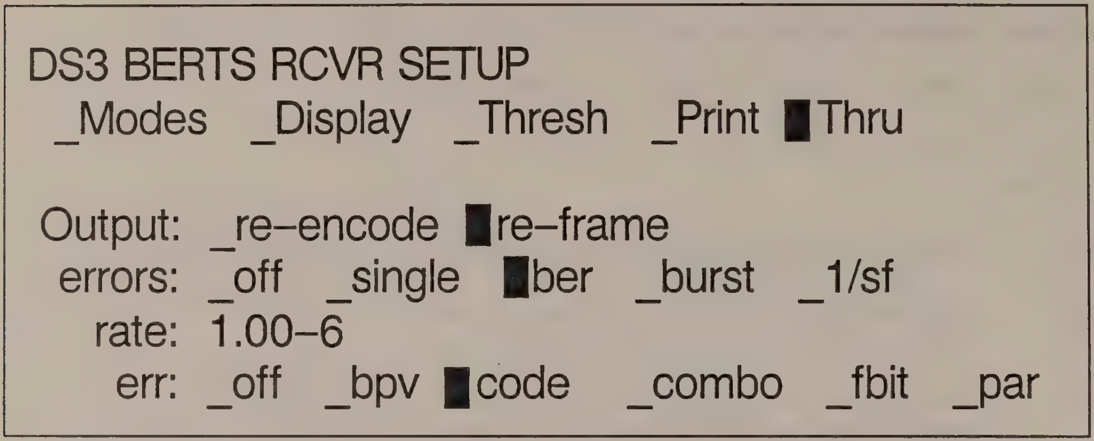
off	Disables all error insertion on data re-transmitted at the DS3 THRU jack.
single	Insert selected single errors on data being re-transmitted at the DS3 THRU jack. Insert single errors by pressing the SHIFT plus ERR INS keys.
ber	Insert errors at the specified Bit Error Rate (ber). The AT 9500 can insert only one type of error at a time with this command. See **Page** 2.
burst	Inserts continuous bursts of errors on the DS3 THRU data stream for the designated time period. After you make the burst error selection, the AT 9500 generates a burst of errors when you press the SHIFT plus ERR INS keys. See **Page** 3.
1/sf	The AT 9500 inserts a single error once per superframe (1/sf) in the output data stream after calculating parity. The AT 9500 inserts the 1/sf error in the P-bits. This selection is available for re-framed output only. See **Page** 4.

FRAME - (single error insertion)

off	The AT 9500 inserts no framing errors.
fbit	Forces the AT 9500 to insert a single F-bit error in the output data stream. **fbit** is available for re-framed output only.
parity	Causes the AT 9500 to insert a single parity error in the re-framed output. **parity** is available in Re-frame Mode only.

CODING - (single error insertion)

off	The AT 9500 inserts no coding errors.
bpv	Inserts a single bipolar violation (bpv) in the encoded output data stream.
code	Inserts a single coding error in the encoded output data stream (causes a bit and F-bit error and a bpv error).
combo	Inserts a single error in the output data stream (causes either a bit and parity error or a framing error).



```
DS3 BERTS RCVR SETUP
 _Modes   _Display   _Thresh   _Print █Thru

 Output:  _re-encode █re-frame
  errors: _off   _single  █ber   _burst   _1/sf
    rate: 1.00-6
     err: _off   _bpv █code    _combo   _fbit   _par
```

Page 2

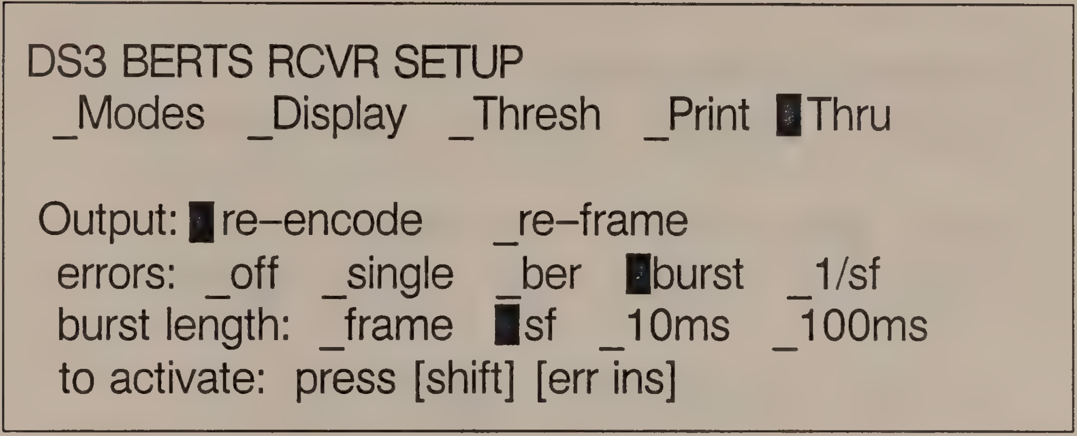
When selecting ber in the errors line of **Page 1**, the lower two **page** lines change to **Page 2**. Refer to **Page** 1 for an explanation of the top lines.

RATE Rate at which the AT 9500 inserts errors into the output data stream. 1 and 6 are variable integers.

- Position ■ adjacent to rate and press **ENTER**.
- Use the ▲/▼ keys to change the values and the ▶/◀ keys to go from the 1 to the 6 field.
- Press **ENTER** to set the value.
- Press **ESCAPE** to void the entry.

ERRORS

off	The AT 9500 inserts no coding errors at the specified rate.
bpv	Inserts single bipolar violations (**bpv**) in the encoded output data stream at a specified **RATE**.
code	Inserts single coding errors in the encoded output data stream at a specified **RATE** (causes bit/F-bit errors and a BPV error).
combo	Inserts single errors in the output data stream at a specified **RATE** (causes either a data pattern/parity error or framing error).
fbit	Inserts F-bit errors at the specified **RATE**. **fbit** works with re-framed mode.
parity	Inserts parity errors at the specified **RATE**. **parity** works with re-framed mode.



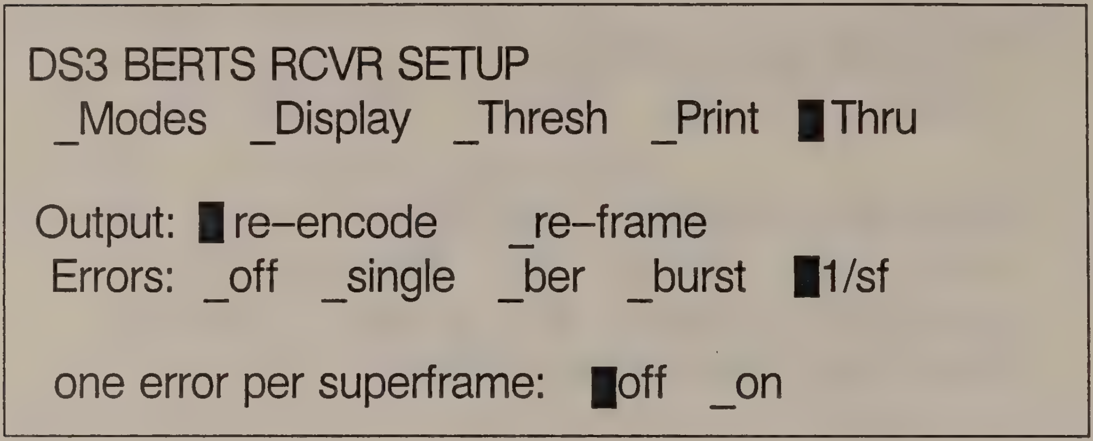
```
DS3 BERTS RCVR SETUP
 _Modes   _Display   _Thresh   _Print █Thru

 Output: █re-encode     _re-frame
  errors:  _off   _single   _ber  █burst   _1/sf
  burst length:  _frame  █sf   _10ms   _100ms
  to activate:  press [shift] [err ins]
```

Page 3

When selecting **burst** in the **errors** line of **Page** 1, the lower two **page** lines change to Page 3. Refer to **Page** 1 for an explanation of the top lines. To activate the error insertion press the SHIFT plus ERR INS keys.

BURST LENGTH

frame	The AT 9500 provides a burst of errors for duration equivalent to one DS3 subframe (680 bits).
sf	sf provides a burst of errors for duration equivalent to one DS3 superframe (4760 bits).
10ms	A 10ms command provides a 10 millisecond burst of errors.
100ms	The 100ms command provides a 100 millisecond burst of errors.



```
DS3 BERTS RCVR SETUP
 _Modes   _Display   _Thresh   _Print  █Thru

Output: █re-encode     _re-frame
 Errors:  _off   _single   _ber   _burst   █1/sf

 one error per superframe:   █off   _on
```

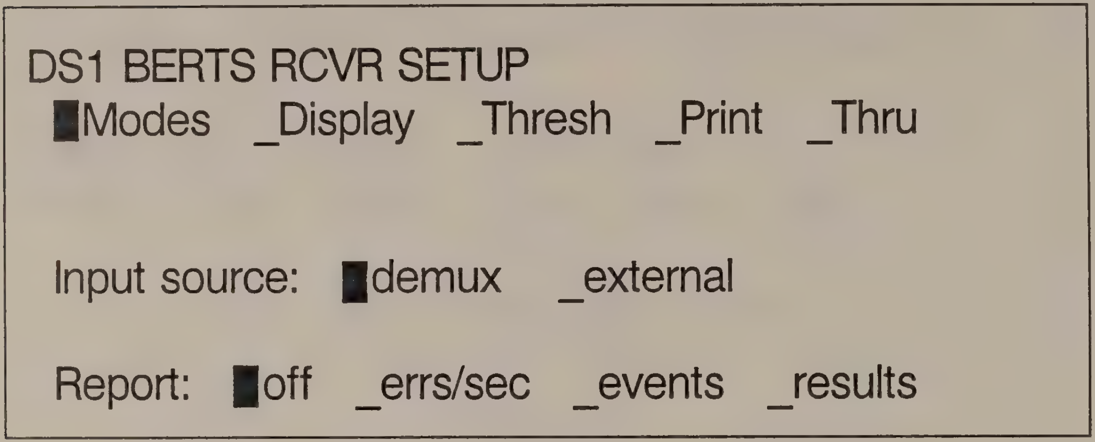
Page 4

When selecting 1/sf in the errors line of **Page 1**, the lower two **page** lines change to **Page** 4. Refer to **Page** 1 for an explanation of the top lines.

ONE ERROR PER SUPERFRAME

off	Disables 1/sf error insertion.
on	Inserts one data error per superframe.

5.4.7 DS1 BERTS RCVR SETUP (Modes)



```
DS1 BERTS RCVR SETUP
 █Modes   _Display   _Thresh   _Print   _Thru


 Input source:  █demux    _external

 Report:  █off   _errs/sec   _events   _results
```

Select the DS1 BERTS Receiver Setup (Modes) **page** to set the following:

- Input Source
- reporting

Input source entry allows you to choose between the direct DS1 front panel Receiver input signal and a DS1 signal demultiplexed from the DS3 Receiver input signal.

The Report line lets you select the conditions causing the AT 9500 to print reports during tests and the format of the printed information.

To make these selections position the ■ in the adjacent field and press ENTER. You can only select one entry per line on the **page**.

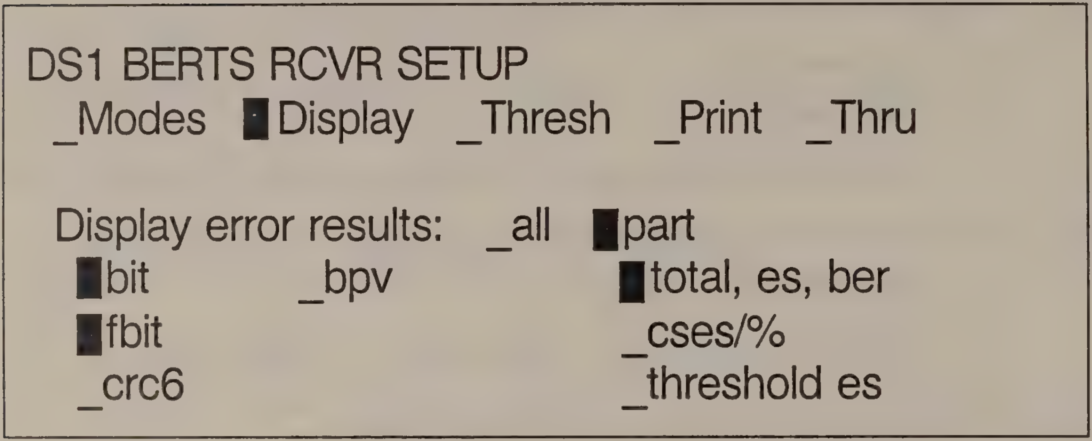
INPUT SOURCE

demux	Selecting **demux** forces the AT 9500 to demultiplex a DS1 signal from a front panel DS3 input. The AT 9500 then analyzes the demultiplexed DS1 signal. When using the **demux** selection, go to the Demultiplexer **page** (Section 5.5) to choose which DS1 (1–28) the AT 9500 will examine.
external	Selecting external causes the test set to select the direct DS1 input from the front panel DS1 RX jack.

REPORT

off	The AT 9500 will not report to the printer during a test. You can still get a printout by pressing the SHIFT plus PRINT keys.
results	Select **results** to issue a report printout at the following events: • start/stop of test • status changes • error occurrences (selected in the PRINT **page** all/part set up, see Section 5.2.10).
events	Select **events** to issue a report printout at: • start/stop of test • status changes
err/secs	Select **err/secs** (error seconds) to issue a report printout at: • start/stop of test • status changes • error occurrences (selected in the PRINT **page** all/part configuration field; see Section 5.4.10). The error seconds report prints a single line of error information for each second in which an error is detected. If the AT 9500 detects more than one of the selected error types during a second, the highest priority error type will be printed. The priority is: bit F-bit CRC6 BPV

5.4.8 DS1 BERTS RCVR SETUP (Display)



```
DS1 BERTS RCVR SETUP
 _Modes  ■Display  _Thresh  _Print  _Thru

 Display error results:  _all  ■part
  ■bit      _bpv            ■total, es, ber
  ■fbit                     _cses/%
  _crc6                     _threshold es
```

The Display **page** lets you select the error measurements that the AT 9500 will report to the front panel display. The **Display error results** entry allows you to select **all** or **part** of the errors the test set is measuring for display on the DS1 Measurement Results **page** (see Section 5.13.2).

When you select **part** on the display, the error types and error measurement categories appear on the bottom two lines of the **page**. To set up the DS1 Measurement Results **page** position the ■ in either the **all** or **part** field and press ENTER.

When you select **part**, press the ▼ key to get to the error types and error measurement categories. Position the ■ in each field you want to measure and press ENTER. Repeat, until your selections are complete. The marked error fields will appear on the DS1 and DS1/DS3 Measurement Results **pages**.

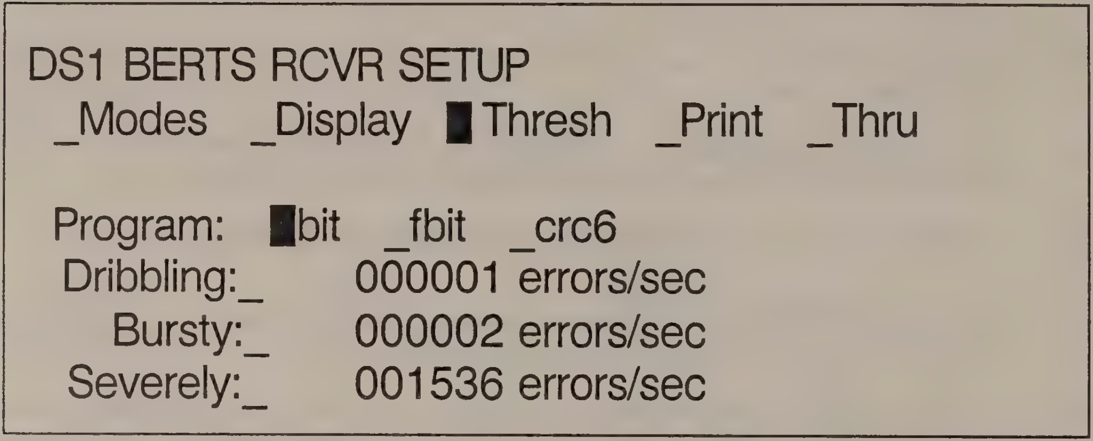
DISPLAY ERROR RESULTS

all	The AT 9500 displays all the DS1 errors for the test.
part	**part** lets you choose which error types and results the AT 9500 will display. Enter this field to display your choices and gain access to the lower three lines on the **page**.

ERROR TYPES AND RESULTS

bit	Bit errors are pattern errors detected in the received data.
bpv	Bipolar Violations (**bpv**) occur when two successive incoming data ones have the same **polarity.**
fbit	Framing bit (F–bit) errors occur when the framing bits in the incoming data stream are not in the proper sequence.
crc6	A crc6 error happens when the crc6 value in the C–bits fails to match the crc6 calculation made on the incoming data. Only valid in Extended Superframe (ESF) mode.
total, es, ber	Total Errors (**total**), Error Seconds (**es**), and Bit Error Rate (**ber**) measurements.
cses/%	The AT 9500 will report Consecutive Severely Errored Seconds (cses), Percent Error Free **Seconds and Percent Errored Seconds (%) measurements.**
threshold es	The AT 9500 will report Dribbling, Bursty, and Severely errored seconds. The AT 9500 makes these measurements based on the error thresholds which are set for each error type (see Section 5.4.9).

5.4.9 DS1 BERTS RCVR SETUP (Thresholds)



```
DS1 BERTS RCVR SETUP
 _Modes   _Display  █Thresh   _Print   _Thru

 Program:   █bit   _fbit   _crc6
  Dribbling:_      000001 errors/sec
     Bursty:_      000002 errors/sec
   Severely:_      001536 errors/sec
```

Select the DS1 BERTS RCVR SETUP thresholds **page** to set the AT 9500 error detection thresholds. The three classes of errors the test set sorts errors into are dribbling, bursty and severely. In addition, the AT 9500 error thresholds can be set for:

- bits
- F–bits
- crc6

The **page** above shows the default values.

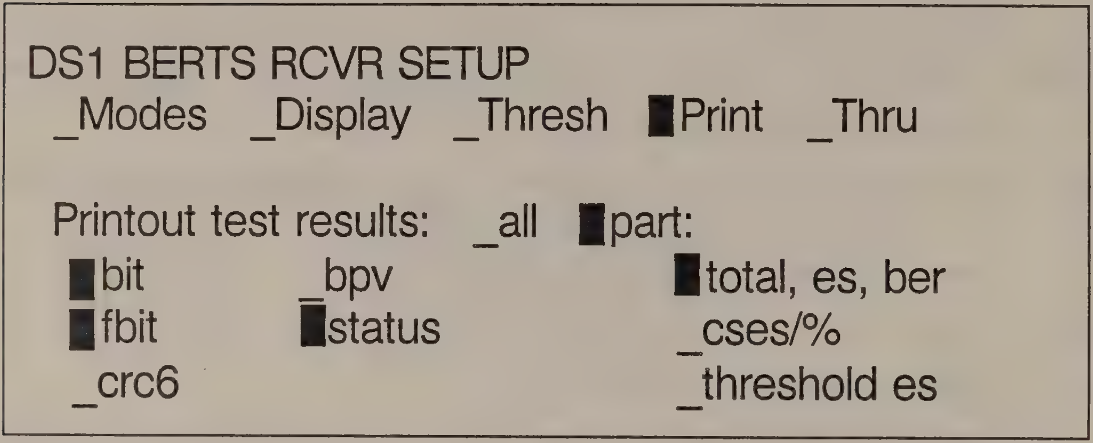
The AT 9500 increments only one of the threshold error counters per second. The instrument can display threshold values as either the number of errors per second (errors/sec), or the Bit Error Rate (error rate). You can modify the thresholds in either error rate or errors/sec. Toggle the display between errors/sec or ber by moving the cursor to the field in front of the numeric values and pressing **ENTER**.

To modify the AT 9500 threshold values select an error type (bit, F–bit, or parity) and move the ■ to the threshold class (dribbling, bursty or severely) you want to change. With the ■ located at the left of one of the threshold class fields, you can enter the value field by pressing the ▶/◀ key. After entering the value field, use the ▲/▼ keys to increase or decrease the value of each digit. When the threshold value is set, press **ENTER** to save the new threshold value.

PROGRAM

bit	Select **bit** to change the thresholds for the DS1 Bit Error Rates.
fbit	Select **fbit** to change the thresholds for the DS1 F–bit error rate.
crc6	Select this field to change the thresholds for the DS1 crc6 measurements.
dribbling	Sets the DS1 low error rate threshold. The AT 9500 counts a second as **dribbling** when: dribbling error threshold $\leq$ # errors < bursty error threshold
bursty	The AT 9500 uses the Bursty error threshold as the DS1 mid–range error threshold (i.e., a small burst of errors). A second is counted as **bursty** when: bursty error threshold $\leq$ # errors < severely error threshold
severely	A second is counted as severely when: # errors $\geq$ severely error threshold The AT 9500 also increments the severely error counter after detecting a loss of the DS1 signal.

5.4.10 DS1 BERTS RCVR SETUP (Print)



```
DS1 BERTS RCVR SETUP
 _Modes   _Display   _Thresh  ■Print   _Thru

 Printout test results:   _all  ■part:
  ■bit          _bpv                ■total, es, ber
  ■fbit         ■status             _cses/%
  _crc6                             _threshold es
```

The Print **page** lets you select the types of DS1 error measurements the AT 9500 will send to the optional printer. The **Printout test results** entry lets you set up the printout to include **all** or **part** of the types of errors and measurements the AT 9500 can make. When you select **part**, the DS1 error types and error measurement categories appear on the bottom half of the **page**.

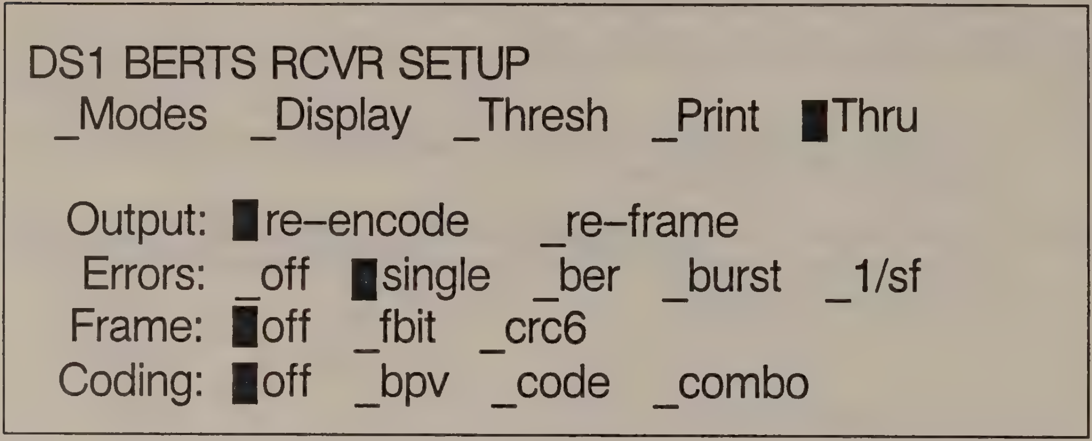
To set up the DS1 printout, position the ■ in the desired (**all** or **part**) field and press the ENTER key. When selecting **part**, press the ▼ key to select the error types and error measurement categories you need to measure. Repeat until the selections are complete. The error fields with a ■ will be on the printouts.

PRINTOUT TEST RESULTS

all	The AT 9500 prints out all of the DS1 measurement results for the test.
part	**part** lets you choose which error types and results the AT 9500 will printout. Enter this field to display the available DS1 selections. Press the ▼ key to get to the selections. Press the **ENTER** key to make the selection.
bit	bit errors are DS1 pattern errors detected in the received data.
bpv	Bipolar Violations (**bpv**) occur when two successive incoming data ones have the same polarity.
fbit	Framing bit errors (**fbit**) occur when the framing bits in the incoming data stream do not follow the proper sequence.

crc6	Available in Extended Superframe (ESF) mode. The AT 9500 counts a crc6 error when the calculated crc6 value in the C–bits does not match the crc6 calculation made on the incoming data.
status	status information will be included in the DS1 error printout.
total, es, ber	**total** (total errors), es (error seconds), and **ber** (Bit Error Rate measurements).
cses/%	Consecutive Severely Errored Seconds (cses), Percent Error Free Seconds and Percent Errored Seconds (%) measurements.
threshold es	Dribbling, Bursty, and Severely errored seconds. The AT 9500 makes these measurements based on the error thresholds which are set for each error type (selected on the DS1 Threshold page).

5.4.11 DS1 BERTS RCVR SETUP (Thru)



```
DS1 BERTS RCVR SETUP
 _Modes  _Display  _Thresh  _Print  █Thru

  Output: █re-encode   _re-frame
  Errors: _off  █single  _ber  _burst  _1/sf
   Frame: █off  _fbit  _crc6
  Coding: █off  _bpv  _code  _combo
```

Page 1

The Thru pages allow you to select output mode and error insertion processing on the DS1 DROP/THRU output signal. The Thru pages also provide the capability of adding errors before retransmitting the received data.

When you select re-framed output, the selected DS1 data (external or demuxed) is re-framed (F-bits and crc6 errors are corrected), re-encoded, and transmitted out the DS1 DROP/THRU jack. When you select re-encode output, the selected DS1 data is re-encoded (BPVs are corrected on external data) and transmitted out the DS1 DROP/THRU jack.

The Thru page also lets you add errors to the received data before it is re-transmitted.

There are four different Thru pages (Pages 1-4), one for each of the error categories. These categories are:

- single
- ber
- burst
- 1/sf

OUTPUT

re-encode	Selects re-encoded data mode for the DS1 DROP/THRU jack.
re-frame	Selects re-framed data for the DS1 DROP/THRU jack.

ERRORS

off	Disables all error insertion on data re-transmitted out the DS1 DROP/THRU jack.
single	Insert selected single errors on data re-transmitted out the DS1 DROP/THRU jack. To insert single errors press the SHIFT plus ERR INS keys.
ber	Insert errors at the specified Bit Error Rate (**ber**). The AT 9500 can insert only one type of error at a time using **ber**. See **"Page 2"**.
burst	Inserts a continuous burst of errors on the data at the DS1 DROP/THRU jack. The error burst lasts for the time period you designate on **Pages 2, 3** or 4. After making the burst error selection, the AT 9500 generates a burst of errors when you press SHIFT plus ERR INS keys.
1/sf	The AT 9500 inserts a single error once per superframe (1/sf) in the output data stream after calculating crc6. The AT 9500 inserts the single error in the C-bits. This selection is available only for re-framed output mode.

FRAME - (single error insertion)

off	The AT 9500 will not insert framing errors.
fbit	Forces the AT 9500 to insert a single F-bit error in the output data stream. **fbit** is available **for re-framed output only.**
crc6	Causes the AT 9500 to insert a single crc6 (ESF only) error in the re-framed output. **crc6** is available in re-frame mode.

CODING - (single error insertion)

off	The AT 9500 inserts no coding errors.
bpv	Inserts a single bpv in the encoded output data stream.
coding	Inserts a single coding error in the encoded output data stream. This command causes the AT 9500 to generate a bit/F-bit error and a bpv error.
combo	Inserts a single error in the output data stream (causes either a data pattern/crc6 error or a framing error).

```
DS1 BERTS RCVR SETUP
 _Modes   _Display   _Thresh  _Print   █Thru

 Output:█ re-encode      _re-frame
  Errors:  _off    _single   █ber   _burst    _1/sf
    Err: █off    _bpv    _code     _combo    _fbit    _crc
   Rate:  1.00-6
```

Page 2

When selecting **ber** in the errors line of **Page 1**, the lower two **page** lines change to look like **Page** 2. Refer to **Page** 1 for an explanation of the top lines.

RATE	Rate at which the AT 9500 inserts errors into the DS1 output data stream. 1 and 6 are variable integers. Position the ■ adjacent to rate and press ENTER. Use the ▲/▼ keys to change the values and the ▶/◀ keys to go from the 1 to the 6 position. Use the ▲/▼ keys to change the value, and press ENTER to set the value. Press ESCAPE to void the value.

ERRORS

off	The AT 9500 will insert no coding errors.
bpv	Inserts single bipolar violations (**bpv**) in the encoded output data stream at a specified **RATE**.
code	Inserts single coding errors in the encoded output data stream at a specified **RATE** (causes bit/F-bit errors and a bpv error).
combo	Inserts single errors in the output data stream at a specified **RATE** (causes either a data pattern/parity error or framing error).
fbit	Inserts F-bit errors at the specified **RATE**. **fbit** works with re-framed mode.
crc	Inserts crc6 errors at the specified **RATE**. **crc6** works with re-framed mode.

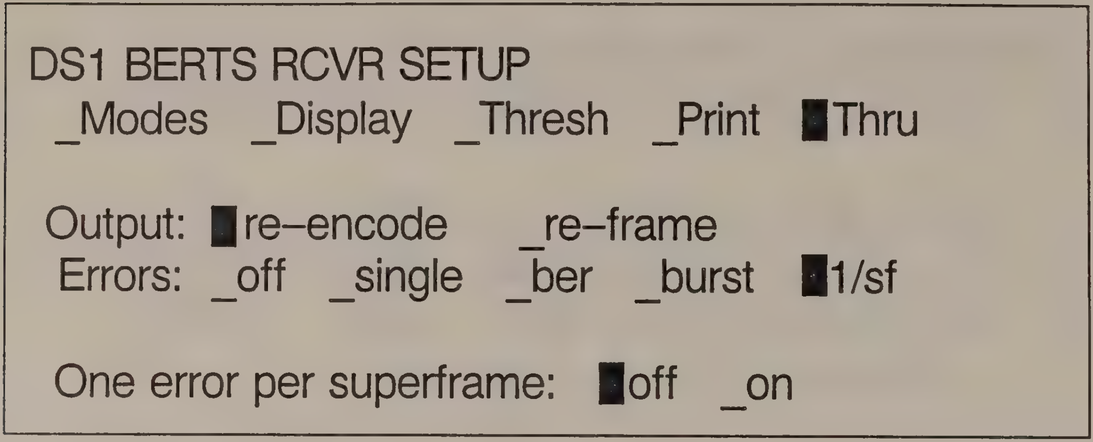
```
DS1 BERTS RCVR SETUP
 _Modes   _Display   _Thresh   _Print  █Thru

 Output: █re-encode    _re-frame
  Errors:  _off   _single   _ber  █burst   _1/sf
  burst length:  _frame  █sf   _10ms   _100ms
  to activate:  press [shift] [err ins]
```

Page 3

When selecting **burst** in the **errors** line of **Page** 1, the lower two **page** lines change to Page 3. Refer to **Page** 1 for an explanation of the top lines. To activate error insertion press the SHIFT plus ERR INS keys.

BURST LENGTH

frame	Provides a burst of errors for a duration equivalent to one DS1 subframe (193 bits).
sf	Provides a burst of errors for duration equivalent to one DS1 superframe (2316 bits or 4632 bits for ESF).
10ms	Provides a 10 millisecond burst of errors.
100ms	Provides a 100 millisecond burst of errors.



```
DS1 BERTS RCVR SETUP
 _Modes   _Display   _Thresh   _Print   █Thru

  Output: █re-encode    _re-frame
   Errors: _off   _single   _ber   _burst   █1/sf

  One error per superframe:  █off   _on
```

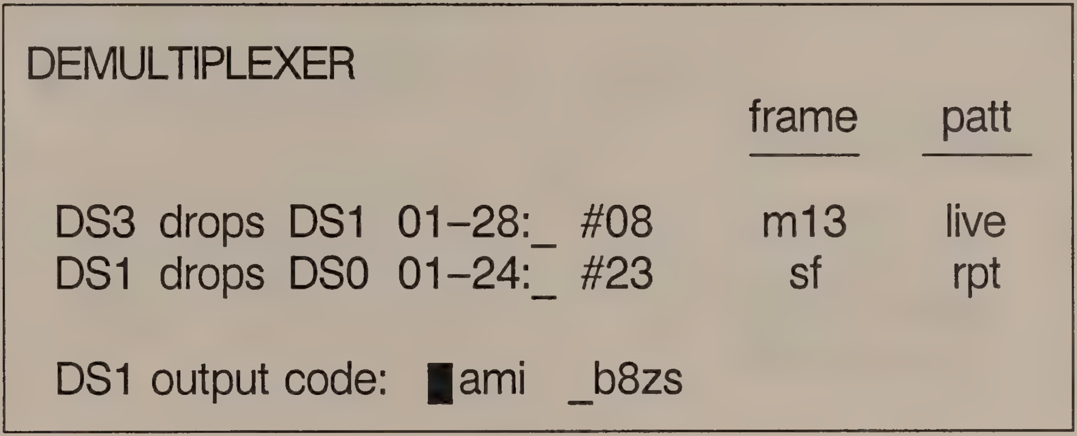
Page 4

When selecting **1/sf** in the **errors** line of **Page** 1, the lower two **page** lines change to **Page** 4. Refer to **Page** 1 for an explanation of the top lines.

ONE ERROR PER SUPERFRAME

off	Disables 1/sf error insertion.
on	Inserts one data error per superframe.

5.5 DEMULTIPLEXER SET UP PAGE



```
DEMULTIPLEXER
                                               frame     patt

   DS3 drops DS1  01-28:_  #08           m13       live
   DS1 drops DS0  01-24:_  #23           sf        rpt

   DS1 output code:  █ami   _b8zs
```

To enable the AT 9500 demultiplexer, press the **DMUX** key on the front panel. This brings up the DEMULTIPLEXER **page** shown above.

The Demultiplexer **page** lets you choose which DS1 channel to drop from a DS3 front panel input. The AT 9500 allows you to drop a DS0 channel from the dropped DS1 channel. You can also drop a DS0 from a DS1 front panel input.

The **page** indicates the framing and pattern status of the DS3 signal and the selected DS1 signal. The DS1 signal can either be demultiplexed or a directly input signal from the front panel.

The DS1 output code entry lets you choose the type of coding for use on the DS1 signals available at the DS1 DROP/THRU output jack.

DS3 drops DS1 01-28 Selects the DS1 channel to drop from the DS3 input signal.Position the ■ in the DS3 drops field and press ENTER. Use the ▲/▼ keys to select a DS1 channel and press ENTER.

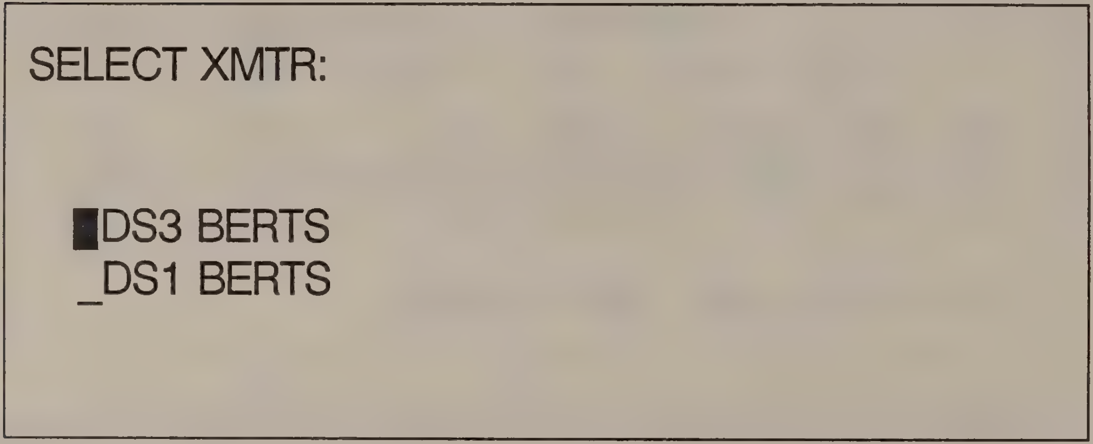
Note – selecting a DS1 signal on the DEMULTIPLEXER **page** does not automatically send the demultiplexed DS1 into the DS1 BERT Receiver. Find information about routing the signal into the DS1 BERT Receiver in Section 5.4.7. On the DS1 BERTS RCVR SETUP (Modes) **page** the input source selection field must be set to **demux** to do error analysis on the demultiplexed DS1.

DS1 drops DS0 01-24 Selects the DS0 channel to drop from the selected DS1 signal. Position the ■ in the DS1 drops field and press ENTER. Use the ▲/▼ keys to select a DS0 channel and press ENTER. The DS0 channel goes to the:

- AT 9500 speaker for audio output
- two front panel DS0 output connectors.

5.6 TRANSMITTER SET UP FUNCTIONS

5.6.1 SELECT XMTR (Select Transmitter)



```
SELECT XMTR:


  ■DS3 BERTS
  _DS1 BERTS
```

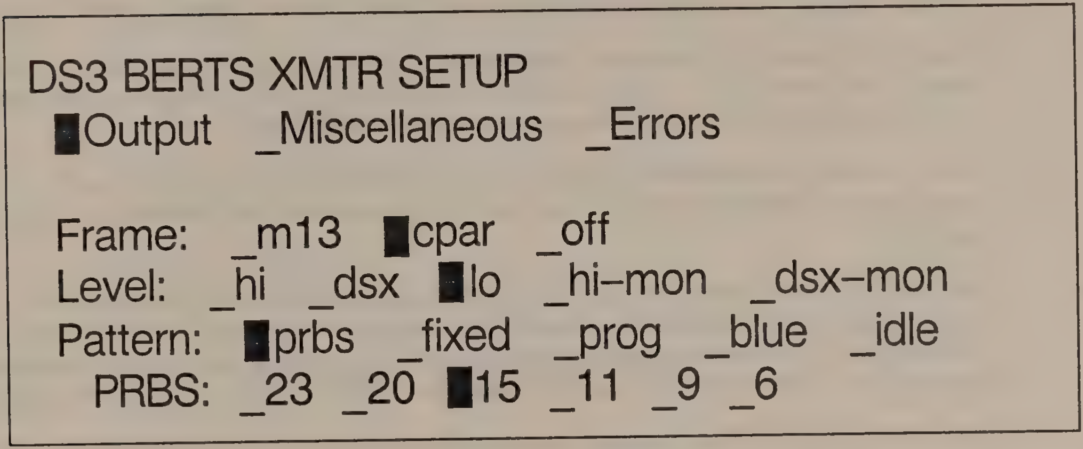
The Select Transmitter page allows you to choose either the DS3 or DS1 transmitter. If necessary, press the ■ next to your selection and then press ENTER. The AT 9500 responds with the selected DS3 or DS1 XMTR SETUP pages.

- Sections 5.6.2 through 5.6.4 describe the DS3 setup pages
- Sections 5.6.5 through 5.6.8 describe the DS1 setup pages.

These sections show each setup page and describe the selections available for you to test and troubleshoot with the AT 9500.

- OUTPUT – lets you set framing, signal level, and data patterns for DS3. The DS1 page lets you set framing, signal coding, or data patterns.
- ERRORS – lets you choose the duration of the inserted errors and the types of errors to insert on both DS3 and DS1.
- MISCELLANEOUS – enables X-bits and set the clock source for DS3.
- LOOPBACK – Lets you select DS1 loopback codes. Enables yellow alarm and sets the clock source for DS1.

5.6.2 DS3 BERTS XMTR SETUP (Output)



```
DS3 BERTS XMTR SETUP
 █Output   _Miscellaneous   _Errors

 Frame:   _m13  █cpar   _off
 Level:  _hi   _dsx  █lo   _hi-mon   _dsx-mon
 Pattern:  █prbs   _fixed   _prog   _blue   _idle
   PRBS:  _23  _20  █15  _11  _9  _6
```

Page 1

Select the DS3 BERTS Transmitter Setup (Output) page to set the following:

- frame type
- signal level
- data pattern

The frame type selection lets you to choose between the three DS3 framing options; M13, C-parity, and OFF.

The Level entry allows you to set the level of the output signal.

Pattern allows you to choose the type of data pattern the AT 9500 transmits in the output data.

To make these selections, position the █ in the adjacent field and press ENTER. You can only select one entry per line on the display.

There are three pages for the DS3 BERTS XMTR SETUP (Output).

FRAME

off	Selects unframed DS3 data transmission. With this selection, every transmitted bit is part of the data pattern. There are no framing overhead bits to allow for frame synchronization.
m13	Selects M13 framing for transmitted output signals. M13 framing is the standard DS3 framing format. M13 causes the AT 9500 to insert overhead bits into the transmitted output signal. These overhead bits provide synchronization for frame alignment. Note – although the **m13** framing format permits transmission of channeled data, the Bit Error Rate Test (BERT) Transmitter only generates unchanneled data patterns in the payload data bits.
cpar	Selects C–bit Parity framing for transmitted output signals. C–bit Parity framing is a DS3 framing format providing enhanced maintenance features. When selecting C–bit parity framing, the AT 9500 inserts overhead bits into the transmitted output signal. These overhead bits provide synchronization for frame alignment and DS3 link maintenance information. Note – although C–Bit Parity framing format allows transmission of channeled data, the BERT Transmitter only generates unchanneled data patterns in the payload data bits.

LEVEL

high	Sets the transmitter output level at **high**.
dsx	Sets the transmitter output at cross–connect level.
low	**low** simulates a signal transmitted through 900 feet of cable.
hi–mon	**hi** monitor simulates signals transmitted at a high monitor point. The high monitor point is –20 dB from high level.
dsx–mon	dsxmonitor level simulates transmitted signals at a cross–connect monitor point. The cross–connect point is –20 dB from dsx level.

PATTERN

prbs	When you choose **prbs**, the next line on the **page** shows the available choices for the prbs signal length. See PRBS.
fixed	Selects a **fixed** bit sequence for the transmitted data pattern. When you select **fixed** pattern, the next line on the page shows the available pattern choices. See **Page** 2.
prog	Selects **programmable** bit sequence for the transmitted data pattern. The next line on the **page** lets you choose the length and bit sequence of the programmable pattern. See **Page** 3.
blue	Selects BLUE signal transmission. The signal is an alternating 1–0 pattern in the payload data with a data 1 following each overhead bit (f[1]1010...), all X–bits are 1, and C–bits are 0.

[1] f is the overhead bit

idle Selects Idle signal transmission which is an alternating double 1–0 pattern in the payload data with the first data 1 following each overhead bit (f[1]11001100...); idle sets all X–bits to 1, and all C–bits (except C–parity bits and C–parity data link–T bits) to 1.

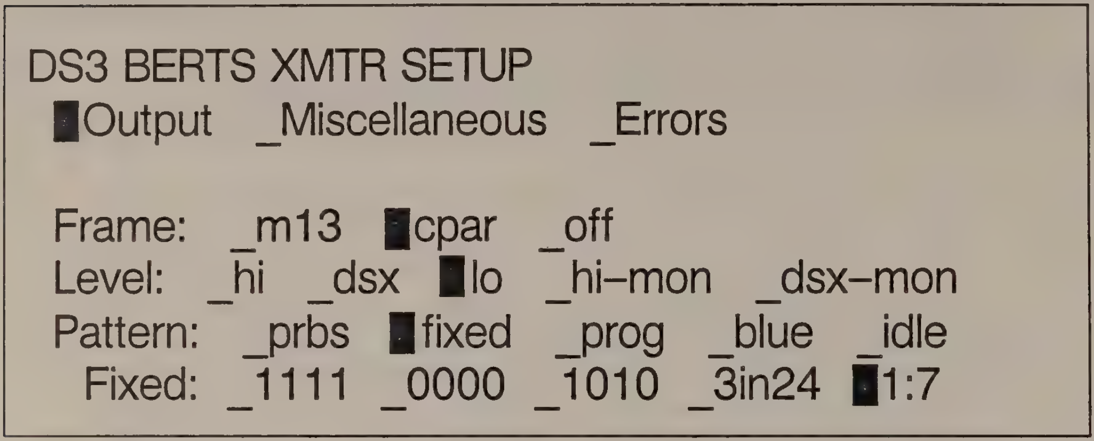
PRBS Select length of prbs data pattern. You have the following choices:

- 23 (2e23 –1)
- 20 (2e20 –1)
- 15 (2e15 –1)
- 11 (2e11 –1)
- 9 (2e9 –1)
- 6 (2e6 –1)

The default prbs pattern for DS3 is 15 (2e15 –1).

---

[1] f is the overhead bit



```
DS3 BERTS XMTR SETUP
 █Output   _Miscellaneous   _Errors

 Frame:   _m13  █cpar  _off
 Level:  _hi   _dsx  █lo   _hi-mon   _dsx-mon
 Pattern:   _prbs  █fixed   _prog   _blue   _idle
  Fixed:  _1111  _0000  _1010  _3in24  █1:7
```

Page 2

When selecting **fixed** in the Pattern line of **Page** 1, the **page** changes to look like **Page** 2. Refer to Page 1 for an explanation of the top lines.

FIXED Select the type of fixed data pattern. The choices follow:

- 1111 (all ones)
- 0000 (all zeros)
- 1010 (1:1)
- 3in24 (100010001000000000000000)
- 1:7 (10000000)

```
DS3 BERTS XMTR SETUP
 █Output  _Miscellaneous  _Errors

 Frame:  _m13  █cpar  _off
 Level:  _hi  _dsx  █lo  _hi-mon  _dsx-mon
 Pattern:  _prbs  _fixed  █prog  _blue  _idle
   Fixed:  _24  _11001100:11001100:11001100
```

Page 3

When you select **Prog** in the Pattern line of **Page** 1, the **page** changes to look like **Page** 3. Refer to **Page** 1 for an explanation of the top lines.

PROG Select length and bit pattern for the programmable pattern.

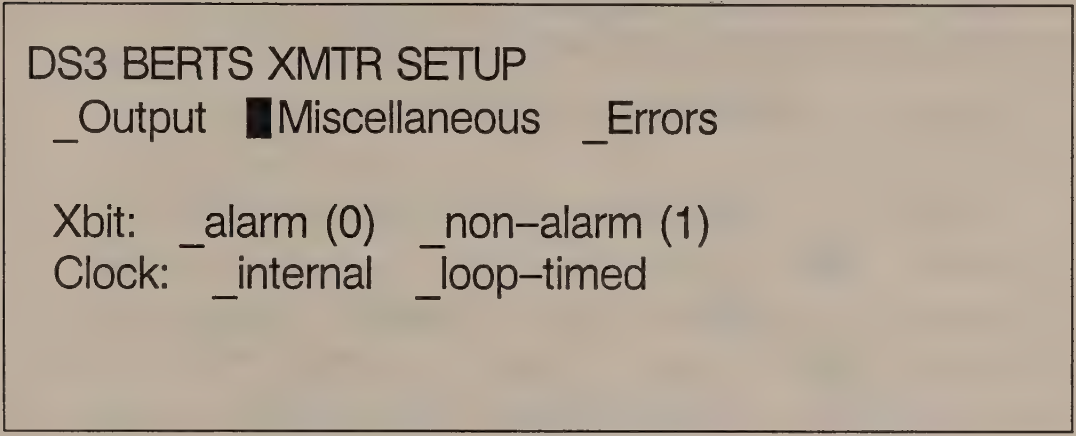
- Length can range from 2 to 24 bits (1 < length < 25).
- Default length is 24 bits.

Use the ◀/▶ keys to get to the program length bit selections. Position the ■ at each digit, and then use the (up/down) keys to change the digit. When you get the desired length, press ENTER. To program a bit sequence:

- press the ▼ key
- use the ◀/▶ keys to position the ■ at each bit
- use the ▲/▼ keys to change the bits

When you get the desired bit pattern on the **page**, press ENTER.

5.6.3 DS3 BERTS XMTR SETUP (Miscellaneous)

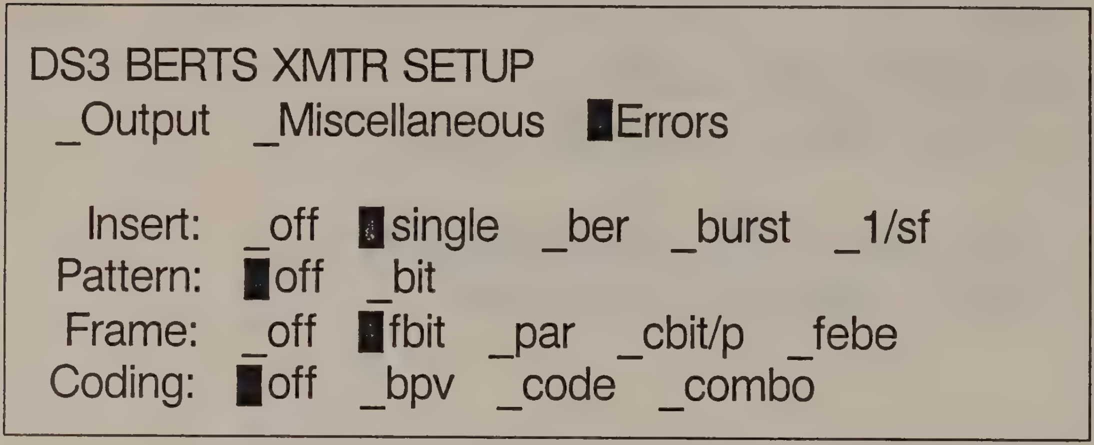


```
DS3 BERTS XMTR SETUP
 _Output ■Miscellaneous  _Errors

 Xbit:   _alarm (0)   _non-alarm (1)
 Clock:   _internal   _loop-timed
```

Select the DS3 BERTS Transmitter Setup (Miscellaneous) **page** to set the transmitted X-bit value and the transmitter clock source. The **xbit** field controls the X-bit alarm. The DS3 Clock selection lets you choose the timing reference for DS3 transmission. To make these selections, position the ■ in the adjacent field and press ENTER. You can select one entry per line on the AT 9500 page.

XBIT	Set the transmitted X-bit value to either 1 (default) or 0. To send an X-bit alarm, select 0. Note – when transmitting BLUE or Idle signals, the X-bit value is set to 1. When the BLUE or Idle signal goes away, the X-bit value will be the one specified in this field. Note – the AT 9500 only transmits X-bits in framed data.
CLOCK	
internal	The DS3 transmitter clock timing source will be an internal crystal ocsillator.
loop-timed	The DS3 transmitter clock timing source will be the recovered clock from the DS3 receiver signal. Note – You should only use loop-timed when receiving an independent DS3 signal.

5.6.4 DS3 BERTS XMTR SETUP (Errors)



```
DS3 BERTS XMTR SETUP
 _Output   _Miscellaneous   ■Errors

   Insert:  _off  ■single  _ber  _burst  _1/sf
  Pattern:  ■off  _bit
    Frame:  _off  ■fbit  _par  _cbit/p  _febe
   Coding:  ■off  _bpv  _code  _combo
```

Page 1

The Errors page lets you insert errors in the transmitted data stream. Errors can be added to the following:

- pre-framed data patterns
- framing bits
- pre-encoded data
- output data after encoding

There are four different error pages, one for each of the error categories. The error categories are as follows:

- single
- ber
- burst
- 1/sf

To make an error insertion selection, position the ■ in the appropriate field, then press ENTER.

INSERT

off	Inserts no errors on data transmitted out of the DS3 TX front panel jacks.
single	Inserts selected single errors on data transmitted out of the DS3 TX jacks. The AT 9500 inserts one type of error in each error category with one insert error operation. The categories follow: • bit (pattern) • parity (framing) • BPV (coding) error Press the SHIFT plus ERR INS keys to insert single errors.
ber	Insert errors at the specified Bit Error Rate (ber). Inserts only one error type at a time with this command. See **Page 2.**
burst	Inserts a continuous burst of errors into the DS3 transmitter data stream for the designated time period. Press the SHIFT plus ERR INS keys to generate the burst of errors.
1/sf	Inserts a single data error in each superframe after the AT 9500 calculates parity.

PATTERN – (single error insertion)

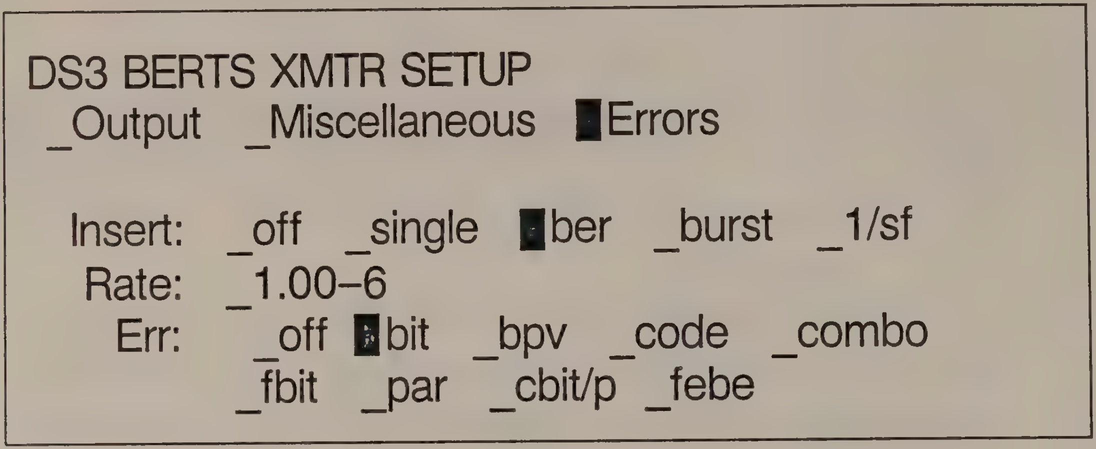
off	The AT 9500 will not insert pattern errors.
bit	Inserts a single data bit (pattern) error in the output.

FRAME – (single error insertion)

off	The AT 9500 will not insert framing errors.
fbit	Inserts a single F–bit error in the output.
parity	Inserts a single parity error in the output.
cbit/p	Inserts a single c–parity error (for C–bit parity framing) in the transmitted output.
febe	Inserts a single Far End Block Error (C–bit parity framing) in the transmitted output.

CODING – (single error insertion)

off	The AT 9500 will not insert coding errors.
bpv	Inserts a single BPV in the encoded output data stream.
code	Inserts a single coding error in the encoded output data stream. Causes both a bit/F–bit error and a BPV error.
combo	Inserts a single error in the output data stream. Causes either a data pattern/parity error or a framing error.



```
DS3 BERTS XMTR SETUP
 _Output   _Miscellaneous   ■Errors

   Insert:  _off   _single  ■ber   _burst   _1/sf
    Rate:   _1.00–6
      Err:    _off ■bit   _bpv   _code   _combo
             _fbit   _par   _cbit/p _febe
```

Page 2

When selecting **ber** in the **Insert** line of **Page** 1, the bottom two lines of the **page** change to look like **Page** 2. Refer to **Page** 1 for an explanation of the top two lines.

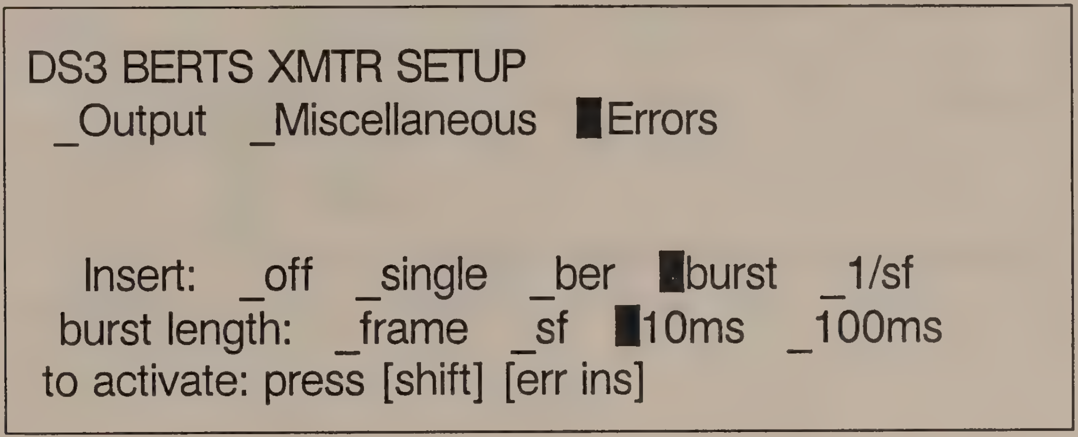
RATE — Rate at which the AT 9500 inserts errors into the DS1 output data stream. The 1 and 6 are variable integers.

- Move the ■ next to **RATE** and press ENTER.
- Use the ▲/▼ keys to change the values and the ▶/◀ keys to go from the 1 to the 6 position.
- Use the ▲/▼ keys to change the value, and press ENTER to set the value.
- Press ESCAPE to clear the entry.

ERRORS

off	The AT 9500 inserts no coding errors.
bit	Inserts single bit errors in the encoded output data stream at a specified **RATE**.
bpv	Inserts single bipolar violations (bpv) in the encoded output data stream at a specified **RATE**.
code	Inserts single coding errors in the encoded output data stream at a specified **RATE** (causes bit/F–bit errors and a BPV error).
combo	Inserts single errors in the output data stream at a specified **RATE** (causes either a data pattern/parity error or framing error).
fbit	Inserts F–bit errors at the specified **RATE**.
par	Inserts parity errors at the specified **RATE**.

cbit/p	Inserts C–parity errors (for C–bit parity framing) in the encoded output data stream.
febe	Inserts Far End Block Errors (C–bit parity framing) in the encoded output data stream.



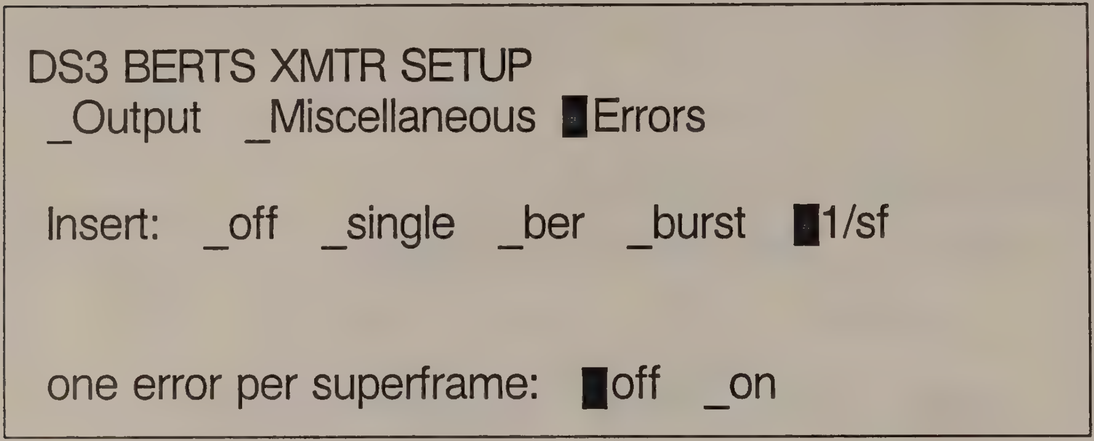
```
DS3 BERTS XMTR SETUP
 _Output  _Miscellaneous  █Errors


   Insert:  _off  _single  _ber  █burst  _1/sf
  burst length:  _frame  _sf  █10ms  _100ms
 to activate: press [shift] [err ins]
```

Page 3

When selecting **burst** in the **Insert** line of **Page** 1, the bottom two lines of the page change to look like **Page** 3. Refer to **Page** 1 for an explanation of the top two lines.

BURST LENGTH

frame	Provides a burst of errors for a duration equivalent to one DS3 subframe (680 bits).
sf	Provides a burst of errors for a duration equivalent to one DS3 superframe (4760 bits).
10ms	Provides a 10 millisecond burst of errors.
100ms	Provides a 100 millisecond burst of errors.



```
DS3 BERTS XMTR SETUP
 _Output   _Miscellaneous █Errors

 Insert:  _off  _single  _ber  _burst  █1/sf


 one error per superframe:  █off  _on
```

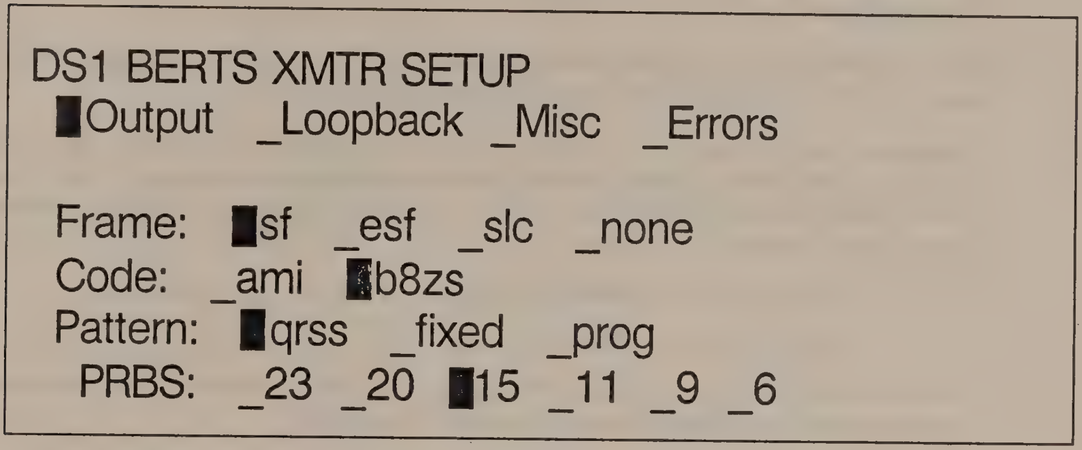
Page 4

When selecting **1/sf** in **Page** 1 the bottom of the **page** changes to look like **Page** 4. Refer to **Page** 1 for an explanation of the top lines.

1/sf

off	Disables one error per superframe (1/sf) error insertion.
on	Inserts one data error in each transmitted superframe. After enabling the 1/sf error insertion feature, the AT 9500 begins to insert errors into the output data stream.

5.6.5 DS1 BERTS XMTR SETUP (Output)



```
DS1 BERTS XMTR SETUP
 ■Output   _Loopback  _Misc   _Errors

 Frame:    ■sf   _esf   _slc   _none
 Code:    _ami   ■b8zs
 Pattern:  ■qrss   _fixed   _prog
  PRBS:   _23  _20  ■15  _11  _9  _6
```

Page 1

To display the DS1 BERTS XMTR SETUP pages, press the **SETUP XMTR** key, move the ■ down to the DS1 BERTS field, and press the ENTER key.

Select the DS1 BERTS XMTR SETUP (Output) page to set the AT 9500 following DS1 transmitter features:

- frame type
- output encoding
- data pattern

The frame type selection lets you choose between four DS1 framing options. The options are superframe (sf), extended superframe (esf), subscriber loop carrier (slc) and OFF.

The Code entry allows you to choose between alternate mark inversion (AMI) and binary 8 zero suppression (B8ZS) for encoding the output signal.

The Pattern selection controls what type of pattern is transmitted in the output data. The available patterns are PRBS, fixed and programmable.

To make these selections move the ■ to the adjacent field and press ENTER. You can select one entry per line on the page.

FRAME

off	Selects unframed DS1 data transmission. Every transmitted bit is part of the selected data pattern. There are no framing overhead bits for frame synchronization.

sf	Selects superframe (SF) framing format for the transmitted output signal. SF framing inserts overhead bits into the transmitted output signal. These overhead bits provide synchronization (frame alignment). Note – although sf framing format allows transmission of channeled data, the transmitter only generates unchanneled data patterns in the payload data bits.
esf	Selects the extended superframe (esf) framing format for the transmitted output signal. ESF framing is a DS1 framing format providing enhanced maintenance features for DS1 transmission. When selecting ESF framing, the AT 9500 inserts overhead bits into the transmitted output signal. Overhead bits provide: • synchronization (frame alignment) • link maintenance information. Note – although ESF framing format allows transmission of channeled data, the transmitter generates unchanneled data patterns in the payload data bits.
slc	Selects Subscriber Loop Carrier (SLC–96) framing format for the transmitted output signal. SLC–96 framing inserts overhead bits into the transmitted output signal. The overhead bits provide: • synchronization (frame alignment) • DS0 channel assignment information • channel bank maintenance information Note – although SLC–96 framing format allows transmission of channeled data, the BERT transmitter only generates unchanneled data patterns in the payload data bits.

CODE

ami	Sets the transmitter encoding to Alternating Mark Inversion (AMI).
b8zs	Selects Bipolar 8 Zero Suppression (b8zs) encoding for the DS1 transmitter output.

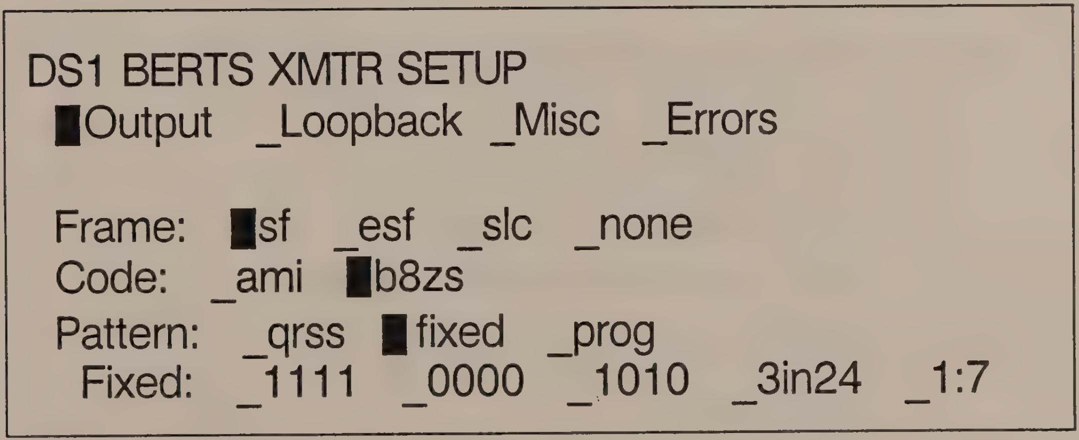
PATTERN

prbs	Selects a pseudo–random bit sequence for the transmitted data pattern. After you select the prbs pattern, the next line on the display shows the choices of prbs length. See PRBS.
fixed	Selects a fixed bit sequence for the transmitted data pattern. When you select the fixed pattern, the next line on the page shows the available fixed pattern choices. See **Page** 2.
prog	Selects programmable bit sequence for the transmitted data pattern. When you select programmable pattern, the next line on the display provides choices for the length and bit sequence of the programmable pattern. See **Page** 3.

PRBS Selects the length of the pseudo-random bit sequence data pattern. The available choices are:

- 23 (2e23 –1)
- 20 (2e20 –1)
- 15 (2e15 –1)
- 11 (2e11 –1)
- 9 (2e9 –1)
- 6 (2e6 –1).

The default prbs pattern for DS1 is 20 (2e20 –1).



```
DS1 BERTS XMTR SETUP
 █Output   _Loopback _Misc   _Errors

 Frame:   █sf    _esf   _slc   _none
 Code:   _ami   █b8zs
 Pattern:  _qrss  █fixed   _prog
  Fixed:  _1111   _0000   _1010   _3in24   _1:7
```

Page 2

FIXED Selects the type of fixed data pattern. The available choices are:

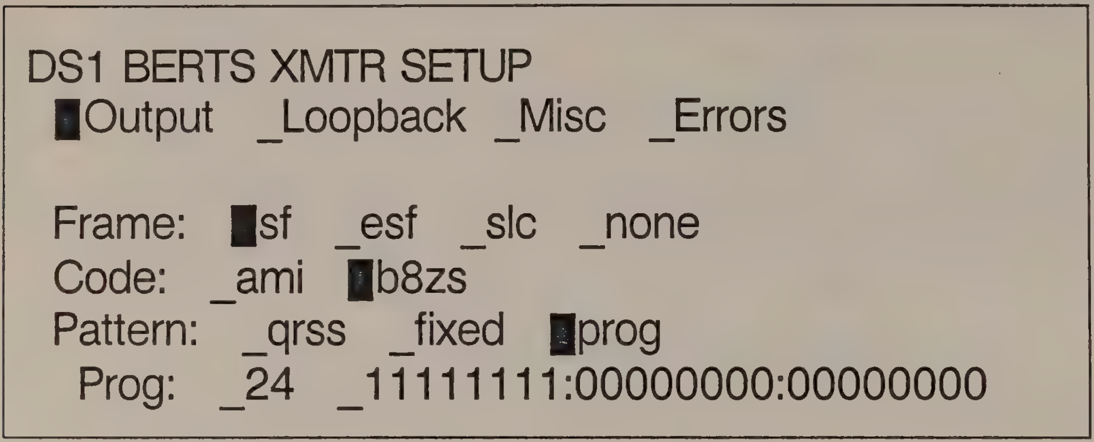
1111 (all ones)

0000 (all zeros)

1010 (1:1)

3in24 (100010001000000000000000)

1:7 (10000000).



```
DS1 BERTS XMTR SETUP
 █Output   _Loopback  _Misc   _Errors

 Frame:   █sf   _esf   _slc   _none
 Code:   _ami   █b8zs
 Pattern:   _qrss   _fixed   █prog
  Prog:   _24   _11111111:00000000:00000000
```

Page 3

When you select the programmable command in **Page** 1, the bottom of the **page** changes to look like **Page** 3. Refer to **Page** 1 for an explanation of the top lines on the **page**.

PROG Selects length and bit pattern for programmable pattern. Bit pattern length can range from 2 to 24 bits. Default length is 24 bits. To select bit pattern length:

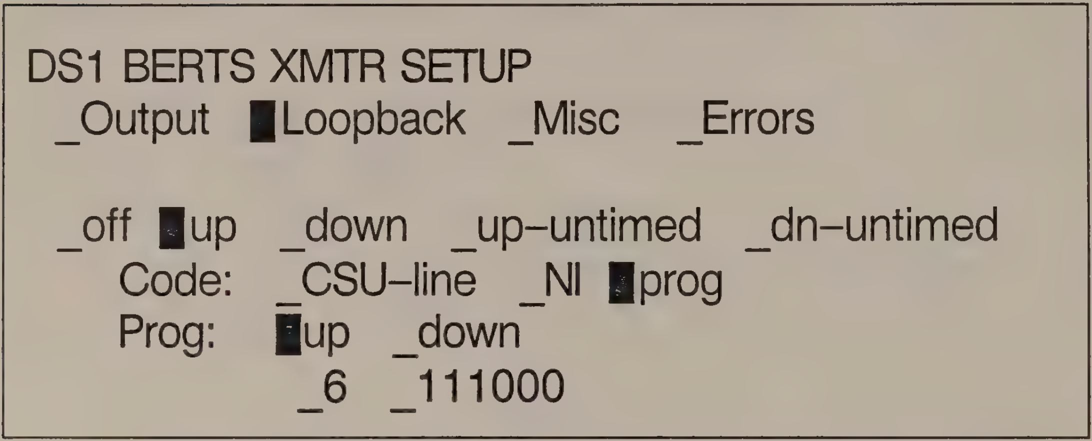
- move the ■ down to the Prog field
- use the ◀/▶ keys to move the ■ to the digit
- use the ▲/▼ keys to change the digits
- When you get the desired signal length, press ENTER

Do the following to program the bit pattern sequence:

- press the ▼ key
- use the ▶/◀ keys to position the ■ at each bit
- use the ▲/▼ keys to change the bits

When you get the desired bit sequence on the **page**, press ENTER.

5.6.6 DS1 BERTS XMTR SETUP (Loopback)



```
DS1 BERTS XMTR SETUP
 _Output  █Loopback  _Misc   _Errors

 _off █up  _down  _up-untimed  _dn-untimed
    Code:  _CSU-line  _NI █prog
    Prog:  █up  _down
             _6  _111000
```

The DS1 BERTS XMTR Setup (Loopback) page allows you to insert loopback codes in the transmitted data stream. You can select:

- the loopback function that is transmitted (▲/▼)
- timed or untimed loopback code transmission
- the type of loopback code that is transmitted
- the length and pattern of programmable codes.

To make these selections, use the ▲/▼ and ▶/◀ keys to position the ■ in the appropriate field and press ENTER.

LOOPBACK

off	Disables Loopback code transmission. In ESF mode, the 4 kilobit data link contains an Idle code (11111111 01111110).
up	Directs the network device to return incoming traffic to its source. When loop-up is selected, the loop code is transmitted for 7 seconds. After the loop-up signal ends, the previously selected pattern resumes.
down	Directs the network device to restore the normal network data path. When loop-down is selected, the loop code is transmitted for 7 seconds. After the loop-down signal ends, the previously selected pattern resumes.
up-untimed	Directs the network device to return incoming traffic to its source. When untimed loop-up is selected, the loop code is transmitted until terminated by another loopback command.
dn-untimed	Directs the network device to restore the normal network data path. When untimed loop-down is selected, the loop code is transmitted until terminated by another loopback command.

CODE

CSU-line Transmit the CSU (line) loopback codes.

- In ESF mode, the following loopback signals are transmitted in the 4 kilobit data link:
  loop-up – 11111111 0 000111 0
  loop-down – 11111111 0 011100 0
- In SF and SLC96 modes, the following loopback signals are transmitted in the payload (data) bits:
  loop-up – 00001
  loop-down – 001

When framing is disabled, these loopback signals are transmitted over the entire DS1 bandwidth.

NI Transmit the Network Interface (NI) loopback codes.

- In ESF mode, the following loopback signals are transmitted in the 4 kilobit data link:
  loop-up – 11111111 0 001001 0
  loop-down – 11111111 0 010010 0
- In SF and SLC96 modes, the following loopback signals are transmitted in the payload (data) bits:
  loop-up – 11000
  loop-down – 11100

When framing is disabled, these loopback signals are transmitted over the entire DS1 bandwidth.

PROG Transmit the user Programmable loopback codes. The programmable loopback codes are typically entered in pairs (loop-up and loop-down). The ESF loopback codes are 6 bits in length and are of the form

11111111 0xxxxxx0

For non-ESF loopback codes, the length and bit pattern are programmable. To enter the programmable codes,

- move the ■ down to the Prog field
- use the ▶/◀ keys to select the loopback type (loop-up or loop-down) to be programmed.

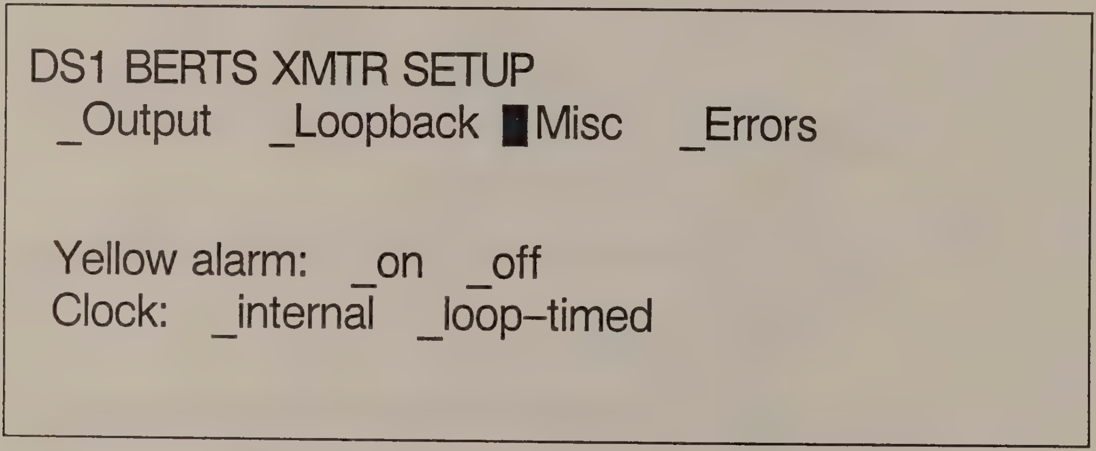
Perform the following steps to select pattern length (non-ESF only):

- Move the ■ down to length field.
- Use the ▶/◀ keys to move the ■ to the digit.
- Use the ▲/▼ keys to change the digit (range is 1 to 8 bits).
- After obtaining the desired signal length, press ENTER.

Perform the following steps to program the pattern sequence:

- Using the ▼ key, move the ■ down to length field pattern.
- Use the ▶/◀ keys to position the ■ at each bit.
- Use the ▲/▼ keys to change the bits to 8 bits.
- After obtaining the desired bit sequence on the page, press ENTER.

5.6.7 DS1 BERTS XMTR SETUP (Misc)



DS1 BERTS XMTR SETUP
_Output _Loopback ■Misc _Errors

Yellow alarm: _on _off
Clock: _internal _loop–timed

The DS1 BERTS XMTR Setup (Miscellaneous) page lets you choose the following:

- Yellow alarm transmission
- The DS1 transmitter clock source

The Yellow alarm selection allows enabling (or disabling) the yellow alarm signal.

The DS1 Clock selection allows selecting the timing reference for DS1 transmission.

To make these selections, use the ▲/▼ and ▶/◀ keys to position the ■ in the appropriate field and press ENTER.

YELLOW ALARM

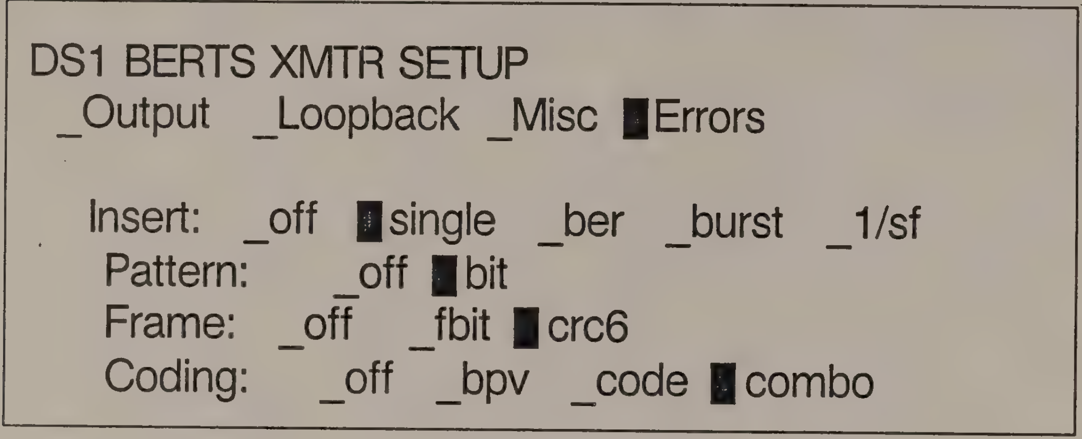
off	Disables Yellow alarm transmission. In ESF mode, the 4 kilobit data link contains an Idle code (11111111 01111110).

on	Enables Yellow alarm. • In ESF mode, the 4 kilobit data link contains the yellow alarm code (11111111 0 000000 0). • In SF and SLC96 modes, bit 2 of each byte of DS0 channel data is set to 0. This may cause a loss of pattern in SF and SLC-96 modes. The AT 9500 transmits the yellow signal until it is disabled. Note – The yellow alarm is not transmitted with loopback codes.

CLOCK

internal	The DS1 transmitter clock timing source is an internal crystal oscillator.
external	The DS1 transmitter clock timing source is the recovered clock from the DS1 Rx signal. Note – Use loop-timed when the AT 9500 receives an independent DS1 signal.

5.6.8 DS1 BERTS XMTR SETUP (Errors)



```
DS1 BERTS XMTR SETUP
 _Output   _Loopback  _Misc ■Errors

  Insert:  _off  ■single   _ber   _burst   _1/sf
   Pattern:      _off ■bit
   Frame:   _off    _fbit ■crc6
   Coding:      _off   _bpv   _code ■combo
```

Page 1

The Errors page allows you to insert errors in the transmitted data stream. You can add errors to:

- pre-framed data patterns
- framing bits
- pre-encoded data
- output data after it has been encoded.

Each of the four error categories has a different page. The error categories of errors include single, ber, burst and 1/sf.

To make an error insertion selection, use the ▲/▼ and ▶/◀ keys to position the ■ in the appropriate field. Then press ENTER.

INSERT

off	Disables all error insertion on data transmitted out the DS1 TX jack.
single	Inserts selected single errors on data transmitted out the DS1 TX jack. You can insert one Pattern, Frame and Coding error type in to the data stream. For example, you could insert single bit (pattern), crc6 (framing), and bpv (coding) errors with one insert error operation. Insert single errors by pressing the SHIFT plus ERR INS key.
ber	Inserts errors at the specified bit error rate (ber). You can insert one error at a time with the ber command. See Page 2.
burst	Inserts a continuous burst of errors on the DS1 XMTR data stream for the designated time period. After you make the burst error choice, the AT 9500 generates a burst of errors when you press the SHIFT plus ERR INS keys.

1/sf	Inserts a single data error (after calculating crc6 in esf mode).

PATTERN – (single error insertion)

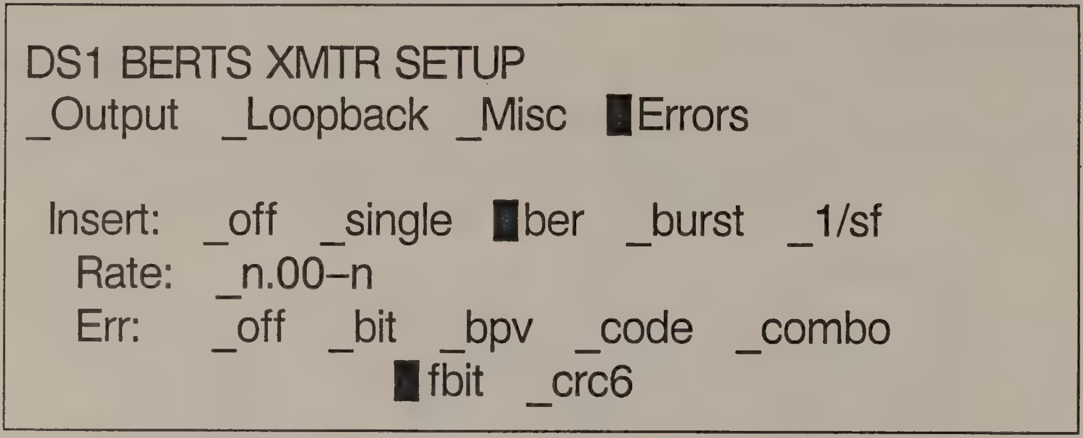
off	The AT 9500 will not insert pattern errors.
bit	Inserts a single data bit (pattern) error in the transmitted output.

FRAME – (single error insertion)

off	The AT 9500 will not insert framing errors.
fbit	Inserts a single F–bit error in the transmitted output.
crc6	Inserts a single crc6 error in the transmitted output (esf only).

CODING – (single error insertion)

off	The AT 9500 will not insert coding errors.
bpv	Inserts a single bipolar violation in the encoded output data stream.
code	Inserts a single coding error in the encoded output data stream. This causes a bit/F–bit error and a bpv error.
combo	Inserts a single error in the output data stream. Causes either a data pattern/crc6 error or a framing error.



```
DS1 BERTS XMTR SETUP
_Output   _Loopback  _Misc   ■Errors

 Insert:   _off   _single   ■ber   _burst   _1/sf
   Rate:   _n.00–n
   Err:     _off   _bit   _bpv   _code   _combo
                      ■fbit   _crc6
```

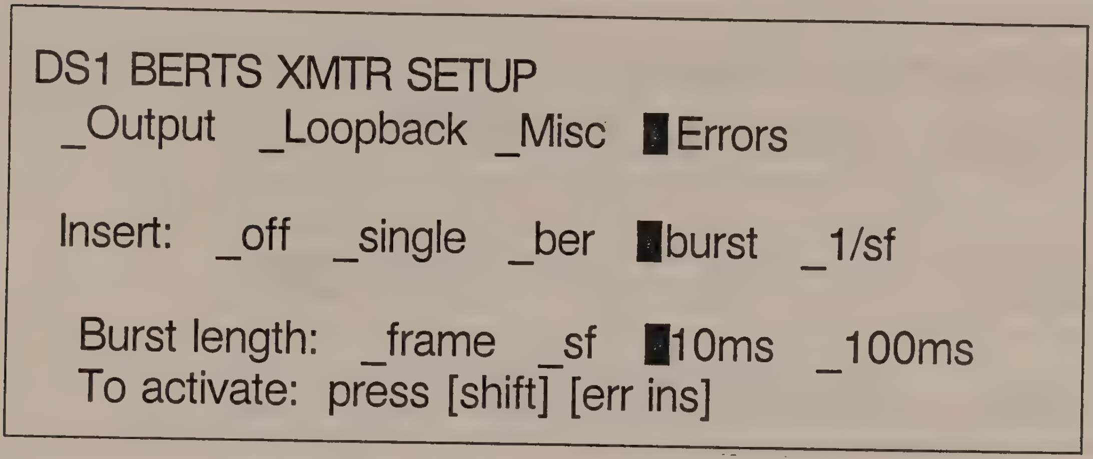
Page 2

When selecting **ber** in the **Insert** line of **Page 1**, the bottom two lines of the **page** change to look like **Page 2**. Refer to **Page 1** for an explanation of the top two lines.

RATE	Rate at which the AT 9500 inserts errors into the DS1 output data stream. The 1 and 6 are variable integers. Move the ■ next to **Rate** and press ENTER. Use the ▲/▼ keys to change the values and the ▶/◀ keys to go from the 1 to the 6 position. Use the ▲/▼ keys to change the value, and press ENTER to set the value. Press ESCAPE to clear the entry.

ERRORS

off	The AT 9500 will not insert errors at the specified rate.
bit	Inserts single **bit** errors in the encoded output data stream at a specified rate.
bpv	Inserts single bipolar violations (**bpv**) in the encoded output data stream at a specified **RATE**.
code	Inserts single coding errors in the encoded output data stream at a specified **RATE**. Code causes bit/F–bit errors and a bpv error.
combo	Inserts single errors in the output data stream at a specified **RATE**. Combo causes either a data pattern/parity error or framing error.
fbit	Inserts F–bit errors at the specified **RATE**.
crc6	Inserts crc6 errors at the specified **RATE**.



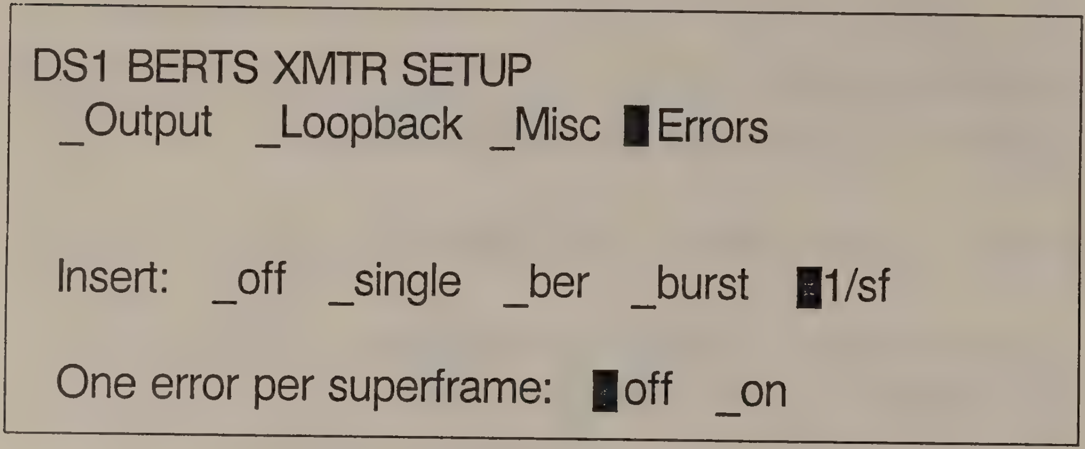
```
DS1 BERTS XMTR SETUP
 _Output   _Loopback  _Misc  █Errors

 Insert:   _off   _single   _ber   █burst   _1/sf

  Burst length:   _frame   _sf   █10ms   _100ms
  To activate:  press [shift] [err ins]
```

Page 3

When selecting **burst** in the **Insert** line of **Page 1**, the bottom two lines of the page change to look like **Page 3**. Refer to **Page 1** for an explanation of the top two lines.

BURST LENGTH

frame	Provides a burst of errors for a duration equivalent to one DS1 subframe (193 bits).
sf	Provides a burst of errors for a duration equivalent to one DS1 superframe (2316 bits or 4632 bits for ESF).
10ms	Provides a 10 millisecond burst of errors.
100ms	Provides a 100 millisecond burst of errors.



DS1 BERTS XMTR SETUP
_Output _Loopback _Misc ■Errors

Insert: _off _single _ber _burst ■1/sf

One error per superframe: ■off _on

Page 4

When selecting **1/sf** in **Page** 1, the bottom of the **page** changes to look like **Page** 4. Refer to **Page** 1 for an explanation of the top lines.

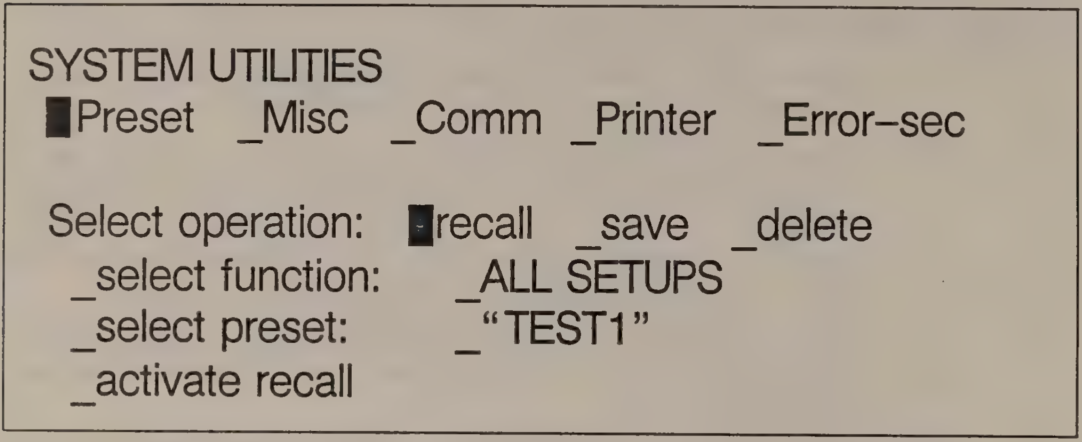
1/sf	Inserts a single data error (after calculating crc6 in esf mode).
off	Disables the one error per superframe (1/sf) error insertion feature.
on	Inserts one data error in each transmitted superframe. After turning ON the 1/sf error insertion feature, the AT 9500 begins to insert errors into the output data stream.

5.7 HOW TO USE THE SYSTEM SETUP PAGES

System Utilities are a family of five pages allowing access to a variety of the important features of the AT 9500. The pages and their features are listed below:

- Preset – lets you recall, save or delete front panel setups. Here are the instructions to save, recall and delete the front panels.
- Miscellaneous – controls the DS1 zero suppression, select frame sync mode. You will find GPIB address and talker/listener set up data at the bottom of the page.
- Comm – lets you set the baud rate and mode for both the COM1 and COM2 ports. These ports are used for Serial communication mode.
- Printer – establishes the communication parameters for the remote printer. Here you set the port for the printer reports, control the timeline, squelch and enter a location id.
- Error–sec – determines how the test set marks time boundaries (synchronous versus asynchronous).

5.7.1 SYSTEM UTILITIES (Preset)



```
SYSTEM UTILITIES
 █Preset   _Misc   _Comm  _Printer   _Error-sec

 Select operation:  █recall   _save   _delete
  _select function:     _ALL SETUPS
  _select preset:       _"TEST1"
  _activate recall
```

The Preset **page** allows you to save, recall, and delete AT 9500 preset panels. Preset panels contain the set up parameters needed to restore the AT 9500 to a predetermined state. When you save the current set up parameters in a preset panel (save **ALL SETUPS**, **TEST1**, for example), the set up can be restored at any time by recalling the desired panel (recall **ALL SETUPS**, **TEST1**, for example). These functions allow you to save and recall a variety of set ups quickly.

Two preset panel-types exist: ALL SETUPS and EZ ON. Both store the present setup selections for all of the functions and system utilities. Recalling a panel for ALL SETUPS restores the AT 9500 function setup selections and system utilities to the predetermined state. Recalling a panel for EZ-ON performs identically, plus activates the EZ-mode.

The EZ Mode is a special feature in the preset panel operation which allows you to lock the AT 9500 in a designated set up. Activate EZ Mode by recalling the preset panel function EZ-ON. EZ-ON is a complete AT 9500 preset panel, containing all the set up parameters for the functions in the AT 9500. When EZ-ON is active, you cannot change the AT 9500 configuration because the front panel SETUP keys (except the Demultiplexer channel select and System Utilities Preset operations) are disabled. To exit EZ mode:

- select the preset panel function, EZ-OFF
- activate this selection.

The AT 9500 maintains the current configuration, but the front panel lock out feature is disabled.

SELECT OPERATION

recall	Enters the procedure to recall a Preset Panel.
save	Enters the procedure to store a preset panel in memory.
delete	Enters the procedure to delete a preset panel in memory.

Use the following procedures to **recall** a stored Preset Panel:

1. Move ■ to **recall** field and press **ENTER**.
2. Select the function that you want to use.
    - move the ■ to **select function** field
    - use ▶ key to move into the name field
    - use ▲/▼ keys to scroll until the desired function appears in the name field.
    - When complete, press **ENTER**.
3. Select the Preset Panel name for the designated function.
    - move the ■ to the **select preset** field
    - use ▶ key to move into the preset name field
    - use ▲/▼ keys to scroll until the desired preset panel name appears in the preset name field.
    - When complete, press **ENTER**.
4. Move the ■ to **activate recall** field and press **ENTER** to recall the preset panel function.

Note – you cannot recall a set up function until you perform this last step.

Use the following procedures to **save** a Preset Panel:

1. Move the ■ to **save** field and press **ENTER**.
2. Select the function that you want to use.
   - move the ■ to the **select function** field
   - use ▶ key to move into the function name field
   - use ▲/▼ keys to scroll until the desired function appears in the function name field.
   - Press **ENTER**.
3. Select a preset panel name for the designated function.
   - move the ■ to the **select preset** field
   - use ▶ key to move into the function name field
   - use ▶/◀ keys to position the ■ on each character position
   - use ▲/▼ keys to scroll until you find the desired character
   - repeat for all characters in the Preset panel name
   - when complete, press **ENTER**.
4. Move the ■ to **activate save** field and press **ENTER** to save the preset panel.

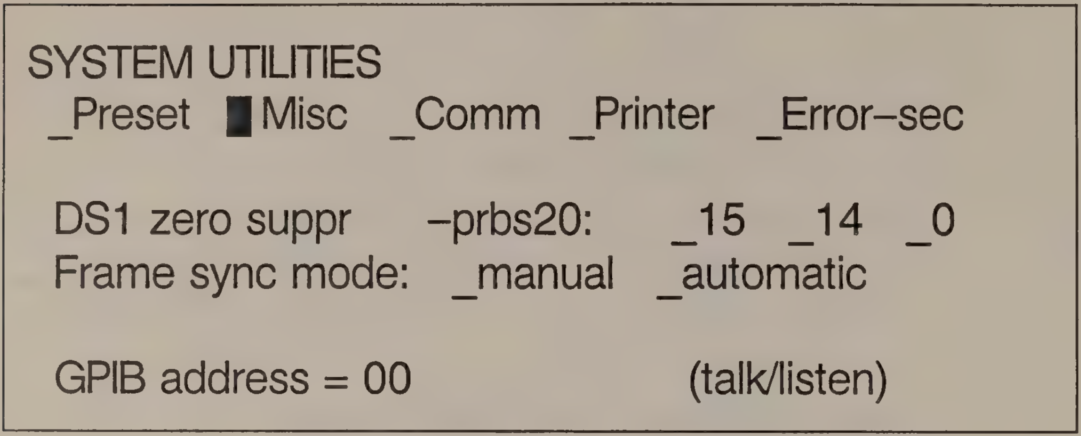
   Note – The AT 9500 does not save the Preset Panel until you perform this last step.

Use the following procedure to **delete** a stored Preset Panel:

1. Move the ■ to **Select operation** field
   - move the ■ to delete field
   - press **ENTER**.
2. Select the function that you want to use.
   - move the ■ to the **select function** field
   - use ▶ key to move into the function name field
   - use ▲/▼ keys to scroll until the desired function appears in the function name field
   - press **ENTER**.
3. Select the preset panel name for the designated function.
   - Move the ■ to the **select preset** field
   - use ▶ key to move into the function name field
   - use ▲/▼ keys to scroll until the desired preset panel name appears in the field
   - when complete, press **ENTER**.
4. Move the ■ to the **activate delete** field and press **ENTER** to cause the delete.

   Note – the AT 9500 does not delete the preset panel until you do step 4.

5.7.2 SYSTEM UTILITIES (Miscellaneous)



```
SYSTEM UTILITIES
 _Preset  ■Misc   _Comm  _Printer   _Error-sec

 DS1 zero suppr    -prbs20:     _15   _14   _0
 Frame sync mode:  _manual   _automatic

 GPIB address = 00                   (talk/listen)
```

The System Utilities Miscellaneous page lets you select the following:

- DS1 zero suppression mode
- receiver function synchronization algorithm
- observe the GPIB port address and configuration.

To make these selections, use the ▲/▼ and ▶/◀ keys to move the ■ to the appropriate field, and press **ENTER**.

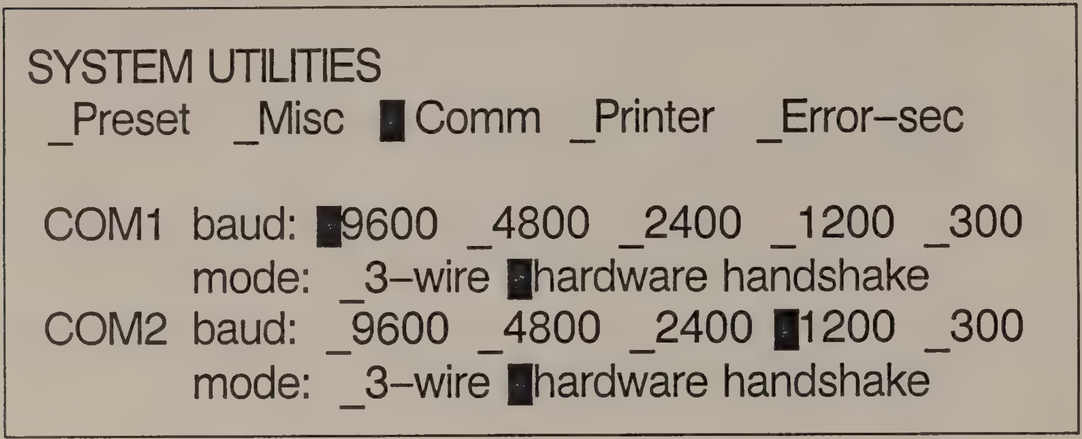
DS1 ZERO SUPPR – PRBS20

15	Performs 15 zero suppression on transmitted and received PRBS 20 patterns. This is the standard for QRSS (quasi-random signal source) and the default value for the AT 9500. In 15 zero suppression the AT 9500 performs a substitution after detecting 15 consecutive 0s in the data pattern. The AT 9500 substitutes a data 1 for the fifteenth 0.
14	Performs 14 zero suppression on transmitted and received PRBS 20 patterns. In 14 zero suppression the AT 9500 performs a substitution after detecting 14 consecutive 0s in the data pattern. The AT 9500 substitutes a data 1 for the fourteenth zero).
0	The AT 9500 will not perform zero suppression.

FRAME SYNC MODE

manual	The DS3 and DS1 receivers only attempt to sync on the frame types selected for the DS3 and DS1 transmitters. For example, if you set the DS1 transmitter to ESF framing, the DS1 receiver only attempts to frame on ESF.
automatic	Both test set receivers search all possible pattern and frame types to establish frame and pattern lock (when no test is running). You can use the transmitters and receivers independently in automatic sync mode. Note – Because the AT 9500 checks every possible frame and pattern combination, Frame and Pattern lock may take a significant period of time (up to 10 seconds for DS1).
GPIB ADDRESS	Displays the GPIB address in this field as well as the current configuration. The address may range from 0–15 and the configuration may be either talk/listen or talk only. Control these parameters with the rear panel eight-position switch.

5.7.3 SYSTEM UTILITIES (Comm)



```
SYSTEM UTILITIES
 _Preset   _Misc  ■Comm  _Printer   _Error-sec

 COM1  baud: ■9600  _4800  _2400  _1200  _300
       mode:  _3-wire ■hardware handshake
 COM2  baud:  _9600  _4800  _2400 ■1200  _300
       mode:  _3-wire ■hardware handshake
```

This page lets you set up the two RS-232 Serial Ports, COM1 and COM2. You can select baud rate and handshake mode for either port.

NOTE

> COM1 refers to the 25-pin RS-232 connector on the rear panel of the AT 9500. COM2 refers to the 9-pin PC AT compatible connector on the rear panel.

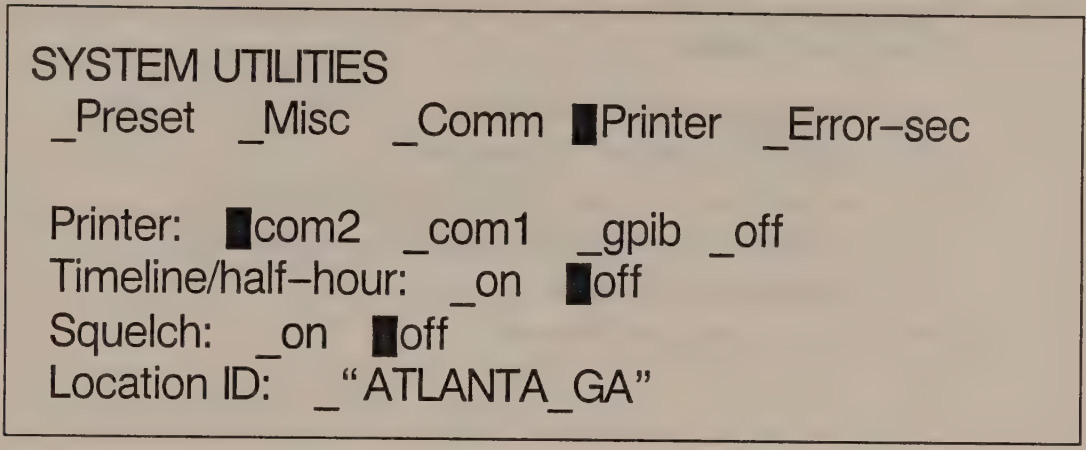
To make these selections, use the ▲/▼ and ▶/◀ keys to position the ■ in the appropriate field, then press **ENTER**.

BAUD	Selects baud rate for the serial communications port.
MODE	Controls the handshaking mode of operation for the serial communications port.

When you select three-wire mode, the port uses software handshake (XON and XOFF) to control information flow into and out of the port.

When you select hardware handshake mode, the port uses RS-232 hardware handshake (DTR and DSR) as well as software handshake (XON and XOFF) to control the information flow into and out of the port.

5.7.4 SYSTEM UTILITIES (Printer)



```
SYSTEM UTILITIES
 _Preset   _Misc   _Comm  █Printer   _Error-sec

 Printer:  █com2   _com1   _gpib  _off
 Timeline/half-hour:   _on   █off
 Squelch:   _on   █off
 Location ID:   _"ATLANTA_GA"
```

The Printer page lets you control the various printer options as well as designate a Location Identification tag for inclusion in all reports (both printer and remote reports).

PRINTER Selects the device (or port) to receive the printer reports. COM2 (a 9-pin PC AT compatible connector) is the default printer device. Printouts can also go to:

- COM1 (a 25-pin RS-232 connector)
- GPIB Interface

TIMELINE/ HALF-HOUR Lets you add a 1/2 hour timeline confidence printout to the printer port output. Use the timeline to verify communication with the printer.

- To add the half hour timeline printout, select timeline/half-hour = on.
- To omit the timeline printout, select timeline/half-hour = off.

SQUELCH Causes the AT 9500 to evaluate the error data to control large Results reports.

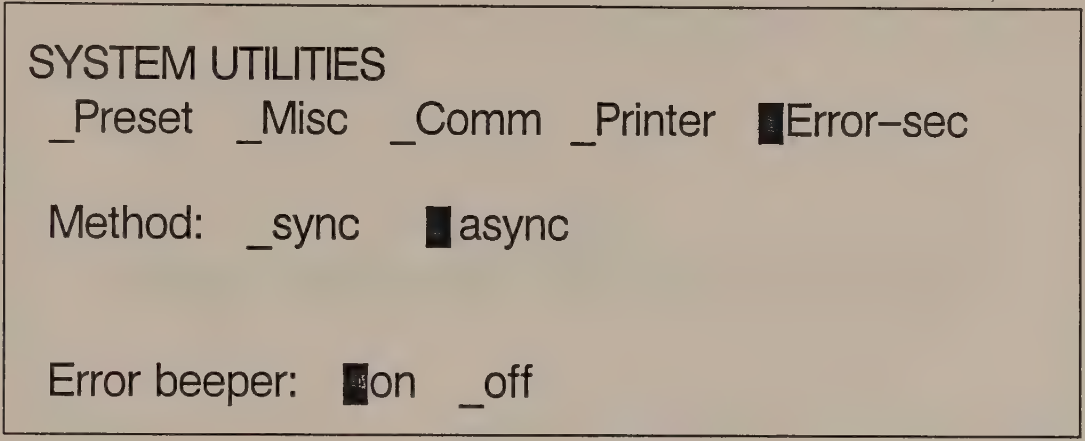
Note – squelch only affects the Results report. For more information on report configuration, see the DS3 and DS1 error report set up sections 5.4.3, 5.4.5, 5.4.8 and 5.4.10.

When you select the Results reports, the squelch algorithm discontinues Results reports when 10 consecutive errored seconds occur. The AT 9500 sends a SQUELCH ON message to inform you of the discontinuity. The AT 9500 reports status changes during Squelch active state, but will not report errors. When 10 consecutive error-free seconds occur,the AT 9500 sends a SQUELCH OFF message, and resumes normal Results report operation.

on	Enables the squelch algorithm.
off	Disables the squelch algorithm.
LOCATION ID	Alphanumeric tag of up to ten characters included in all printouts and remote reports. To enter a new Location ID:

- move the ■ to the Location ID field
- use ▶ key to move into the name field
- use ▶/◀ keys to position the ■ in each character position
- use ▲/▼ keys to scroll until you find the desired character
- repeat this process for each character in the name
- when complete press ENTER key

5.7.5 SYSTEM UTILITIES (Error-sec)



```
SYSTEM UTILITIES
 _Preset   _Misc   _Comm   _Printer   █Error-sec

 Method:   _sync   █async


 Error beeper:  █on   _off
```

This page lets you select the method the AT 9500 uses to determine error second boundaries, as well as providing control of the error beeper.

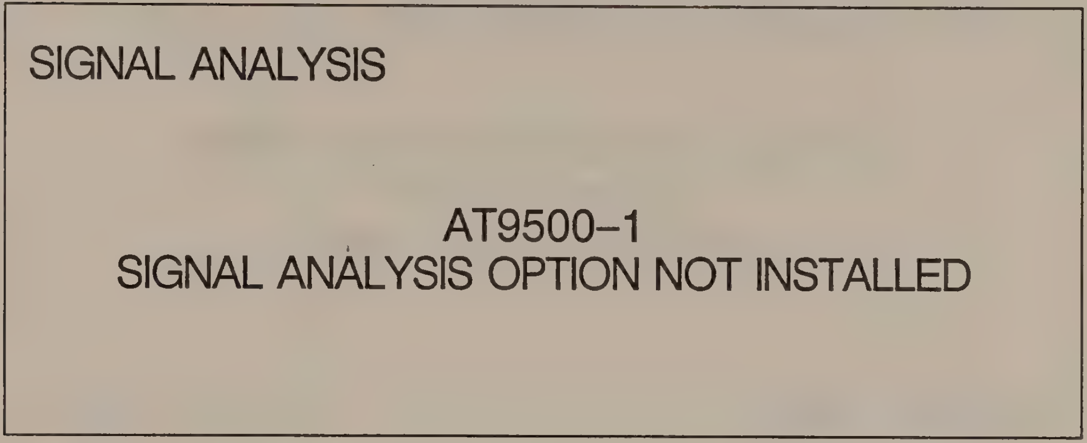
METHOD

Synchronous	An error event is the time reference to mark the error second boundaries. This is similar to using a stopwatch to count error seconds. • The timer starts after detecting the first error event, and continues to count as long as one or more error events occur in each consecutive time period (second). • When the AT 9500 detects no error events in a time period, the timer stops. The timer does not restart until the next error event is detected.
asynchronous	Sets the Real Time Clock (RTC) as the time reference to mark error second boundaries. This is similar to using a wristwatch as a reference to count error seconds. If an error occurs within a second, that second is called an error second.

ERROR BEEPER

on	Enables the audible error alarm. The AT 9500 produces an audible tone during each second that it detects a SES.
off	Disables the audible error alarm.

5.8 HOW TO USE THE SIGNAL ANALYSIS FEATURE

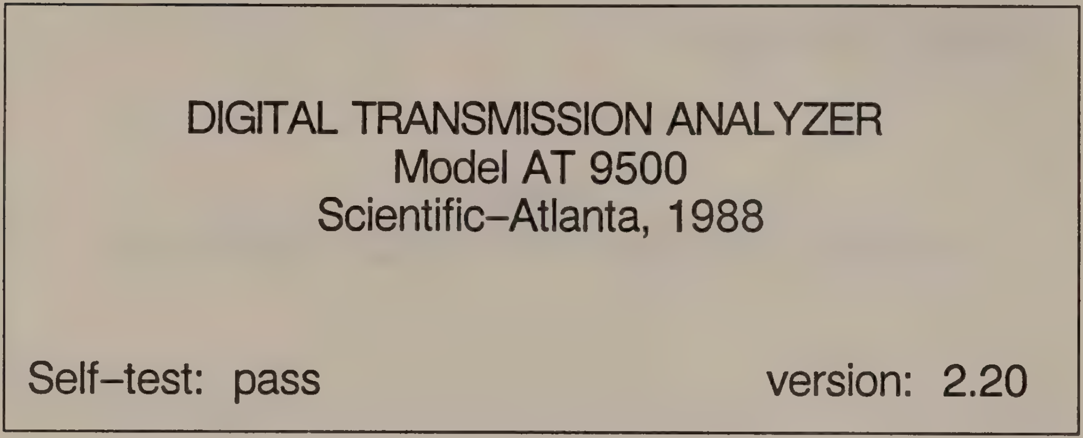


SIGNAL ANALYSIS

AT9500–1
SIGNAL ANALYSIS OPTION NOT INSTALLED

The Signal Analysis feature is an AT 9500 option. The functional description appears in the Appendix section.

5.9 DIGITAL TRANSMISSION ANALYZER (Sign on Page)



DIGITAL TRANSMISSION ANALYZER
Model AT 9500
Scientific–Atlanta, 1988

Self–test: pass version: 2.20

The test set Sign On **page** appears on the front panel during the power up sequence. The page provides the results of the AT 9500 diagnostic self test, and indicates the software version number.

When the Sign On **page** is visible, you can generate an instrument reset by pressing the **SHIFT** plus **CLEAR** key. This initializes the AT 9500 with all the test set default parameters.

5.10 LEVEL OVERRIDE SET UP

The **LEVEL** key provides a DS3 level override feature. When using the **LEVEL** key to select programmable level, **PROG** (the LED below the **PROG** label lights), enabling the DS3 level selections made for the transmitter and receiver. When using the **LEVEL** key to select **DSX** (LED below **DSX** lights), the AT 9500 ignores the DS3 level selections made for the transmitter and receiver functions. The AT 9500 uses DSX level for both the transmitter and receiver functions. This is called DSX Override because the programmable level values do not change when DSX level override is enabled. Returning the **LEVEL** key to **PROG** re-establishes the programmed level values.

5.11 STATUS

The Status section of the front panel (see Figure 5.3) is a grouping of LEDs which inform you of important conditions in the signal under test. Table 5.4 describes the function of each LED grouping.

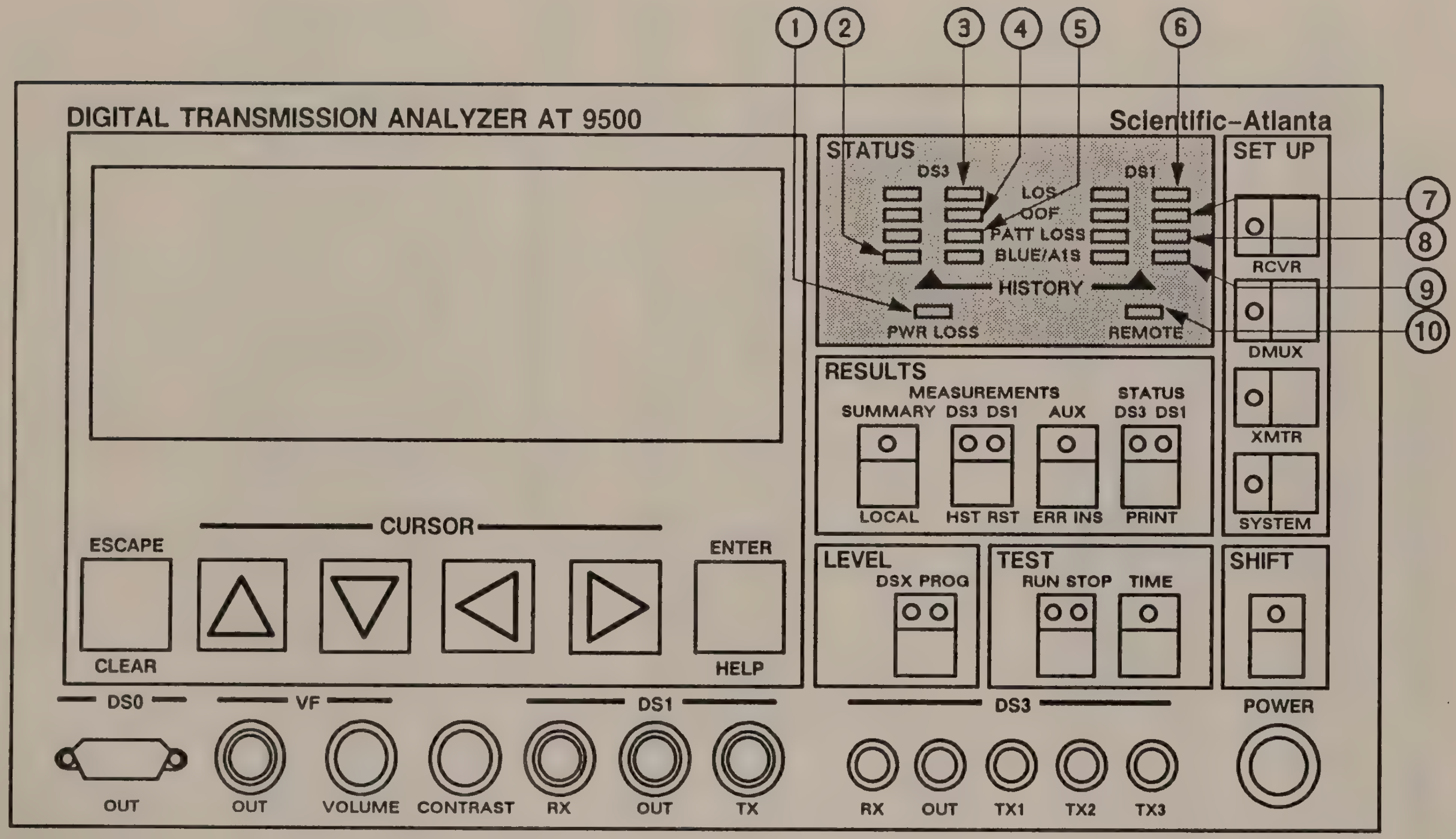


Figure 5.3. AT 9500 Status Indicators

Table 5.4
Status Indicators

Key	Designation	Function
1	PWR LOSS	Indicates ac power status during the current test. Press **SHIFT** plus **HST RST** to reset the indicator.
2	BLUE/A1S	The red and yellow LEDs light to indicate that the AT 9500 received a DS3 BLUE alarm signal. Red indicates the test set is currently receiving a DS3 BLUE signal and a yellow indicates the test set detected a BLUE signal during the test. The red LED resets when the BLUE signal goes away.
3	DS3 LOS	The red LED lights to indicate a DS3 Loss of Signal. The red LED extinguishes when the signal is reacquired. The yellow LED lights when the DS3 signal is initially lost and remains on until the test set is turned OFF or you press **SHIFT** plus **HST RST**.
4	DS3 OOF	The red LED lights to indicate a DS3 out-of-frame condition. The red LED goes OFF when the AT 9500 reframes. The yellow LED lights when framing is lost and remains ON until the test set is turned OFF or you press **SHIFT** plus **HST RST**.
5	PATT LOSS	The red LED lights to indicate a DS3 pattern loss condition. The red LED resets when the AT 9500 reacquires a pattern. The yellow LED lights when pattern is lost and stays ON until the AT 9500 is turned OFF or you press **SHIFT** plus **HST RST**.
6	DS1 LOS	The red and yellow LEDs function the same as DS3 LOS to monitor the selected pattern.
7	DS1 OOF	The red and yellow LEDs function the same as DS3 OOF to monitor the selected framing.
8	PATT LOSS	The red and yellow LEDs function the same as DS3 PATT LOSS to monitor the selected pattern.
9	BLUE/A1S	The red and yellow LEDs function the same as DS3 BLUE to monitor the input for a DS1 All Ones signal.
10	REMOTE	The red LED lights when the AT 9500 is controlled remotely by a controller over the GPIB data bus or the RS-232 Serial Link. When the REMOTE LED lights the instrument front keys are ignored. To leave remote control press the SHIFT + LOCAL keys (see Results Section 5.13).

5.12 TEST

The Test section of the front panel (see Figure 5.4) is a grouping of two switches with LEDs. The switches allow you to start and stop tests and enter the test duration selection process. Table 5.5 describes the switch and LED function.

Table 5.5
Test Controls and Indicators

Key	Control	Function
1	TIME	The TIME switch allows you to select among Elapsed, Single and Repeat test modes. • Untimed mode starts the test at time t=0 and counts up until the test is stopped. • A single timed test starts the test at a programmed time, counts down to zero and then concludes the test. • A repeat timed test starts the test at a programmed time, counts down to zero and then repeats the test until the test is stopped.
2	RUN/STOP	Press this switch to start or stop the test. • The green LED below RUN lights to indicate that a timed test is running. • The red LED below STOP lights to indicates that no tests are running.

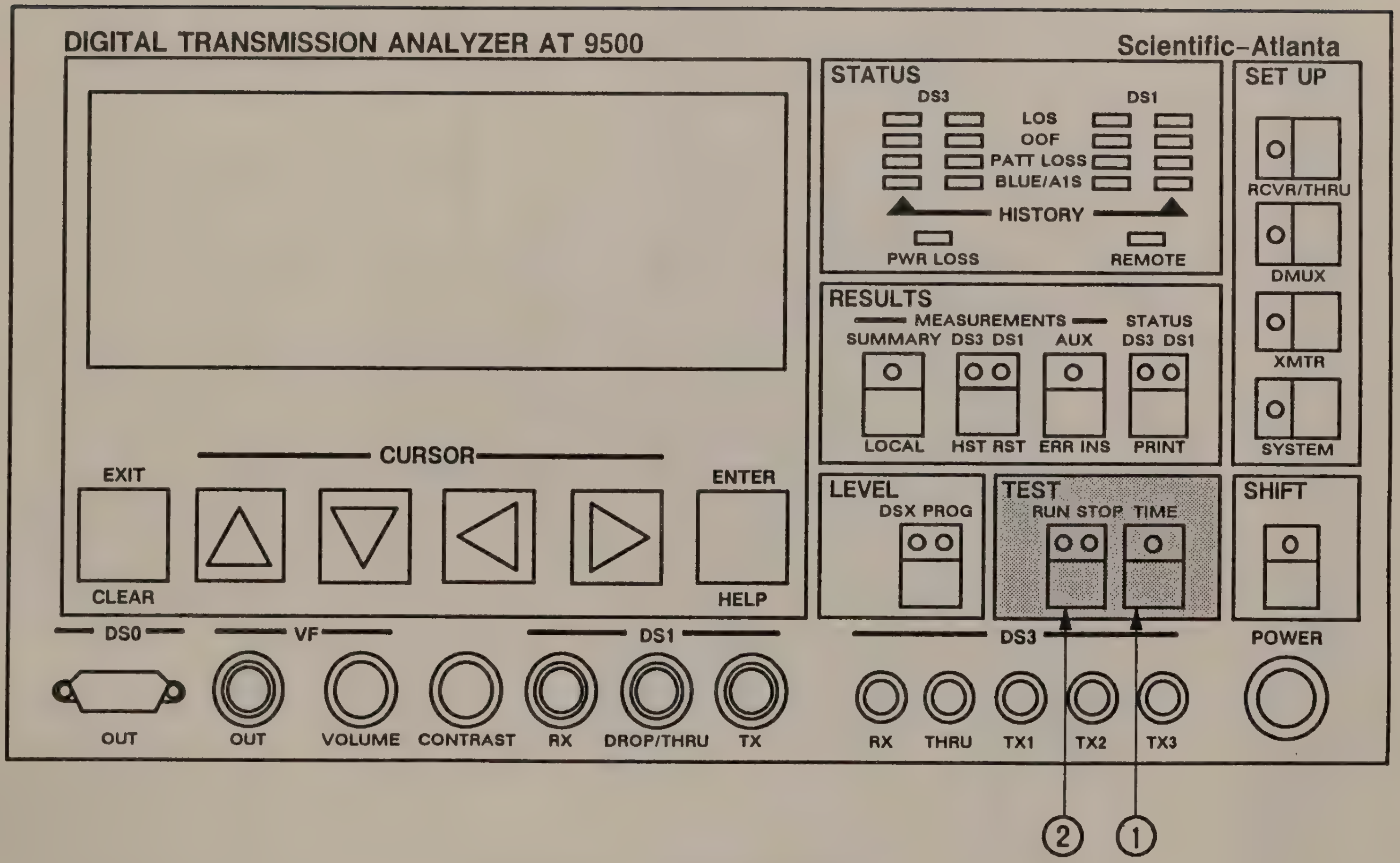
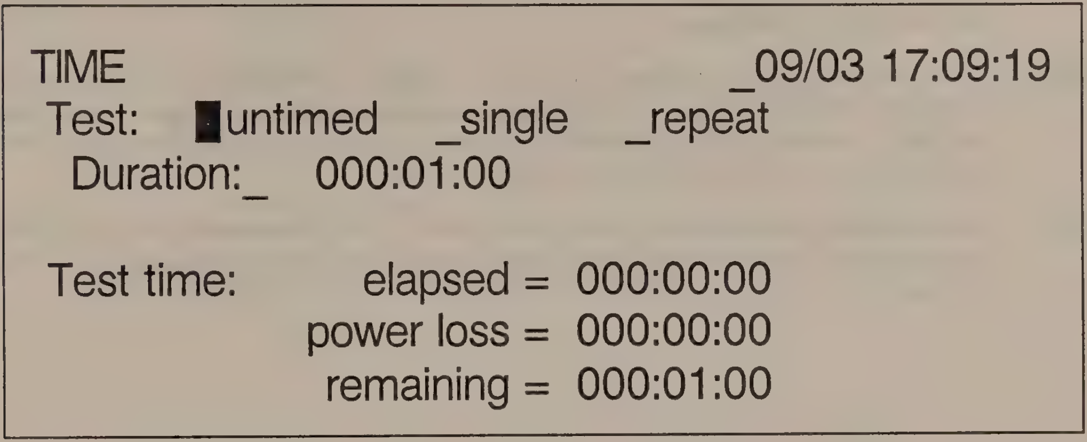


Figure 5.4. AT 9500 Test Section

5.12.1 TIME (Receiver Status)



```
TIME                                              _09/03 17:09:19
 Test:    ■untimed     _single     _repeat
  Duration:_   000:01:00

 Test time:          elapsed =  000:00:00
                  power loss =  000:00:00
                   remaining =  000:01:00
```

Select the TIME **page** to set up the timekeeping facilities of the AT 9500 and to check the test time Status. The top line of the TIME **page** provides the current Date and Time Of Day settings for the test set. To change the Date or Time of Day:

- move ■ into the date or time field
- use ▶/◀ keys to position the ■ at each digit
- use ▲/▼ keys to change numbers in the field.

The second line of the TIME **page** allows you to select the type of test that the AT 9500 will execute. The test types are **untimed, single** and **repeat.**

The third line of the TIME **page** lets you control the **Duration** of a timed test in single and repeat testing modes. To set the test length:

- move ■ to **Duration** field
- use ▶ key to enter data field
- use ▶/◀ keys to position ■ at digits
- use ▲/▼ keys to change digits in the field.

The bottom half of the TIME **page** provides timekeeping status for the AT 9500. The **elapsed** field indicates the run time of the test in progress. The complementary **remaining** field indicates how much time remains until the normal completion of the test in progress. The **remaining** time field is not applicable for untimed tests.

The **power loss** field indicates how long the AT 9500 lost power during the test.

TEST TYPE

untimed	Use **untimed** command to check the status of a digital network. **untimed** is the best command when you do not need to know bit error rate. The AT 9500 accumulates results until you give a STOP command.
single	Use the **single** command to check the status of a digital network when you need to know bit error rate. The AT 9500 accumulates results until the specified time duration expires. When the time duration ends, the AT 9500 stops the test. To end a test in progress enter STOP at the controller or press **STOP** key on the front panel.
repeat	**repeat** cycles a timed test until the AT 9500 receives a **STOP** command. The test set accumulates results until the specified time duration expires, then reports the results to the printer or display.

5.13 RESULTS

The RESULTS section of the front panel (Figure 5.5) is a grouping of controls and indicators, separated into four related subsections:

- Summary/Local
- DS3/DS1 Measurement
- AUX
- DS3/DS1 Status

Table 5.6 describes RESULTS controls and indicators.

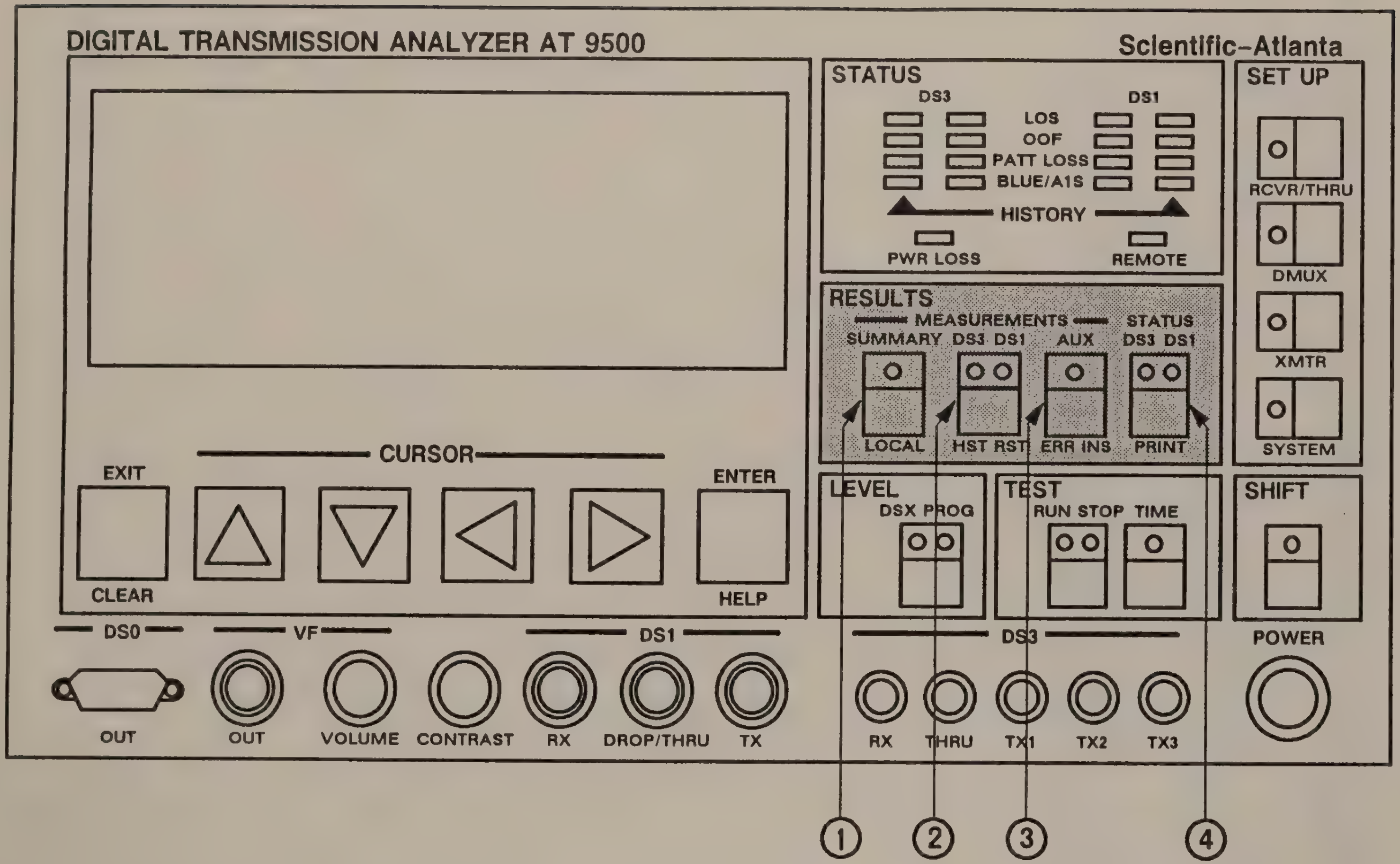
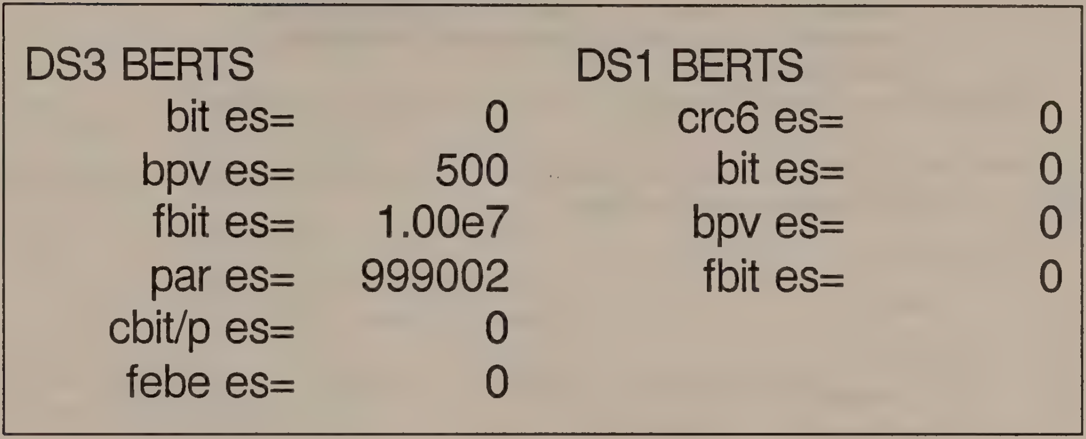


Figure 5.5. Results Controls and Indicators

Table 5.6
Results Controls and Indicators

Key	Control	Function
1	SUMMARY/ LOCAL	Pressing the **SUMMARY** key causes a display of DS3 and DS1 error summaries. The AT 9500 provides summaries in either error second (es) results or gated error rate. The LED is ON when es results is the selection. The LED flashes to indicate selection of the gated error rate. See Section 5.13.1 for detailed descriptions of the measurements page. Press the **SHIFT** plus **LOCAL** keys to disable the remote interfaces and return the test set to front panel control.
2	DS3/ DS1/ HST RST	Pressing the **DS3/DS1 MEASUREMENTS** key toggles the display between DS3 and DS1 error results. The LEDs light to indicate the selected error data result. When you select this key, the display changes to show results pages. See Sections 5.13.2 through 5.13.4 for descriptions of error measurements pages accessible with this key. Pressing **SHIFT** plus **HST RST** resets yellow STATUS indicators on the front panel (see Section 5.11).
3	AUX/ ERR INS	Sets the display to show the results of measurements made by the optional Signal Analysis feature. Pressing **SHIFT** plus **ERR INS** keys inserts single errors into the transmitter output data stream.
4	STATUS DS3/ DS1/ PRINT	The **STATUS DS3/DS1** key causes the test set to display the results of DS3 and DS1 status and alarms on the LCD. The LED lights to indicate the selected data rate. Pressing **SHIFT** plus **PRINT** sends the output to the printer. See the section How to Use the Printer for details on using a printer.

5.13.1 DS3 BERTS/DS1 BERTS (Summary)



```
DS3 BERTS                         DS1 BERTS
       bit es=          0              crc6 es=        0
       bpv es=        500               bit es=        0
      fbit es=     1.00e7               bpv es=        0
       par es=     999002              fbit es=        0
    cbit/p es=          0
      febe es=          0
```

Select the DS3/DS1 BERTS Summary **page** to get an overview of the test results. The Summary **page** displays two types of information, error seconds and gated BER (bit error rate).

For the error second summary, the AT 9500 displays the number of error seconds (es) counted for each of the error types on the Summary **page**. When a test is not in progress, the values displayed on the Summary **page** will be totals from the previous test.

For the gated BER Summary, the AT 9500 displays the current gated error rate (over a one second period) for each of the available error types on the Summary **page**. When a test is not in progress, the values displayed on the Summary **page** will be the last values from the previous test. The LED on the Summary key blinks when BER values are displayed.

The test set places "n/a" in the value field (es or gated BER) for error types which are not applicable for a particular test.

- For example, if you test a live DS3 traffic signal, the Summary **page** shows "n/a" in the bit (pattern) es field and the bit (pattern) gated BER field, because the test set can not identify a pattern in live traffic.
- Another example is a test on a DS1 signal in which the superframe (sf) framing format is utilized, the test set displays "n/a" in the crc6 es field because crc6 data does not exist in the sf format.

A number of Status Conditions can affect the es counts. When a Loss of Signal (LOS) condition occurs during a test, the test set counts error seconds for all valid error types.

NOTE

> Although the AT 9500 counts error seconds for each second in which it detects a LOS, no errors are counted and no gated BERs are measured during this time. This maintains the integrity of the error and error rate measurements, and at the same time counts LOS seconds as error seconds.

When the AT 9500 detects an Out of Frame (OOF) condition during a test, it counts error seconds for all valid framing error types including:

F–bit

febe

parity

C–bit/parity

crc6 errors

When the AT 9500 detects a Pattern Loss (PATT LOS or LOP) event during a test, it counts error seconds for bit (pattern) errors. For OOF and LOP conditions, the corresponding error types (framing and pattern errors) will not display gated BER measurements.

ERROR TYPES

bit es A bit error second is counted for each second in which:

- one or more bit (pattern) errors occur
- a Signal Loss (LOS) condition happens
- a Pattern Loss (PATT LOS or LOP) condition occurs.

bpv es A bipolar violation error second is counted for each second in which:

- one or more bpvs occur
- a LOS condition happens.

fbit es A framing bit error second is counted for each second in which:

- one or more F–bit errors occur
- a LOS condition occurs, or
- an Out of Frame (OOF) condition happens.

par es (DS3 only) A parity error second is counted for each second in which:

- one or more parity errors occur
- a LOS condition happens, or
- an OOF condition occurs.

febe es (DS3 CPAR only) A Far End Block Error (febe) error second is counted for each second in which:

- one or more febes occur,
- a LOS condition happens, or
- an OOF condition happens.

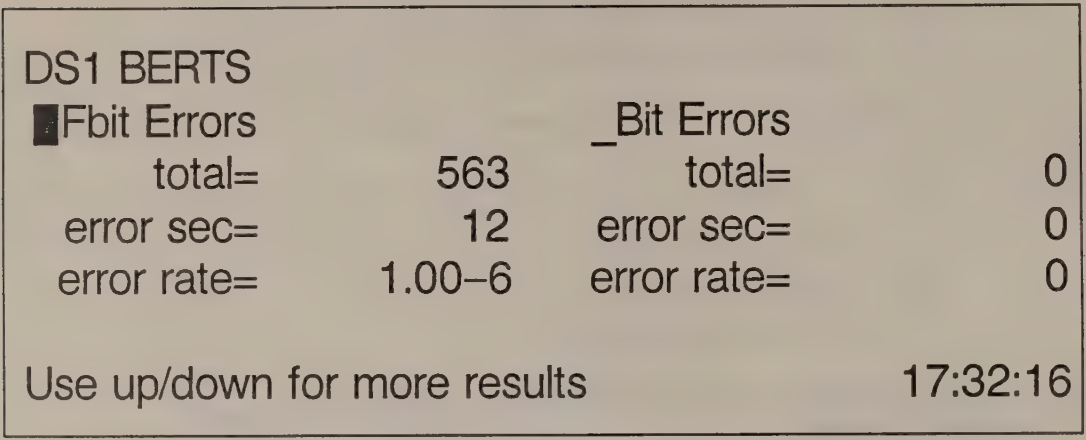
cbit/p es (DS3 only) A cbit–parity error second in M13 framing is counted for each second in which:

- one or more cbit/p errors occur
- a LOS condition occurs, or
- an X–bit alarm condition happens.

crc6 es (DS1 ESF only) A crc6 error second is counted for each second in which:

- one or more crc6 errors occur
- a LOS condition occurs, or
- an OOF condition occurs.

5.13.2 DS1 BERTS (Receiver Measurement)



```
DS1 BERTS
■Fbit Errors                  _Bit Errors
      total=         563            total=        0
  error sec=          12        error sec=        0
 error rate=      1.00-6       error rate=        0

Use up/down for more results               17:32:16
```

Select the DS1 BERTS Receiver Measurement Results page to view the results of the DS1 measurements and measurement analysis. The Measurement Results page has a split display so that you can view two sets of results simultaneously. Both the left and right LCD fields display DS1 results when the green DS1 LED above the DS3/DS1 MEASUREMENTS Results key lights.

To see DS3 measurement results, press the DS3/DS1 MEASUREMENT Results key until the green DS3 LED lights. When both LEDs light, the LCD shows DS3 measurement results in the left page field and DS1 measurement results in the right page field.

To get measurement results:

- use ▶/◀ keys to move the ■ to left or right display field
- use ▲/▼ keys to find measurement results.

Two factors determine which Measurement results appear on this page:

- measurement validity
- display set up

Only valid measurements appear from the current test (run mode) or from the previous test (stop mode) on the Measurement Results page.

- For example, crc6 measurement results will not appear when the incoming DS1 signal is formatted using the Superframe (SF) framing because crc6 is not a valid measurement for SF signals.
- The measurements which will appear on the DS1 Measurement Results page is controlled on the DS1 Receiver Display page (see Section 5.4.8 for details on DS1 display set up). When you select a partial display, only those measurement types that are selected in the display set up will be available for viewing. See Section 5.4.8 for information about changing the measurement display configuration.

ERROR TYPES

bit	A bit error is counted when an incoming data bit (excluding any framing bits) does not match the value the test set predicts for the selected pattern.
bpv	A bipolar violation (bpv) is counted when: • two consecutive data ones have the same polarity, and • a valid zero substitution is not detected.
fbit	An F-bit error is counted when an incoming framing bit does not match the value predicted by the selected frame type.
crc6	A crc6 error is counted when: • the framing type is ESF, and • the crc6 value found in the C-bits does not match the crc6 value the test set calculated from the previous frame.

MEASUREMENT/ANALYSIS CATEGORIES

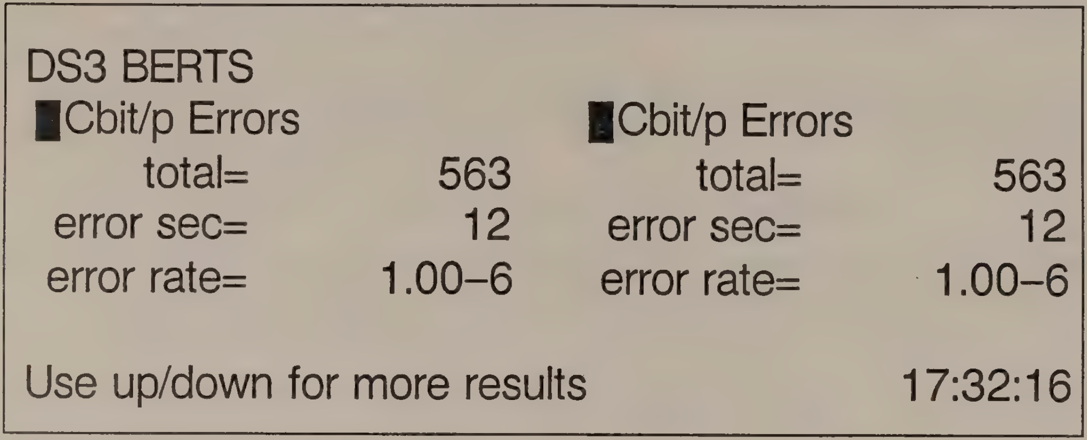
total	Total errors are the number of errors of a particular type[1] counted during a test.
error sec	Error seconds are the number of seconds in which: • the test set counts one or more errors of a particular type, or • the designated status error condition for a particular error type[1] occurs (for example, LOS for all error types). For details of these status error conditions, see the error second definitions in Section 5.13.1.
error rate	The rate at which errors[1] occur. error rate is the ratio of the total errors and the number of possible errors of an error type[1].
%error free	The ratio between the number of seconds not containing errors of a particular type[1] with the total number of seconds in the test.

---

[1] The particular errors that the test set counts are controlled in the test set up. You may select from bit, bpv, F-bit and crc6.

%error sec	The ratio between the error seconds of a particular type and the total number of seconds during the test.
consec ses	The number of occurrences of three or more consecutive seconds in which the the severely errored second criteria are met.
dribbling es	The number of seconds in which the number of errors (or error rate) of a particular type meets or exceeds the threshold setting for dribbling error seconds, but is less than the threshold for bursty error seconds: dribbling threshold ≤ number of errors/second < bursty es threshold
bursty es	The number of seconds in which the number of errors (or error rate) of a particular type meets or exceeds the threshold setting for bursty error seconds, but is less than the threshold for severely error seconds: bursty threshold ≤ number of errors/second < severely threshold
severely es	The number of seconds in which: • the number of errors (or error rate) of a particular type meets or exceeds the threshold setting for severely error seconds: severely threshold ≤ number of errors per second, or • A designated status error condition for a particular error type occurs (for example, LOS for all error types). For details of these status error conditions, see error second definitions in Section 5.13.1.

5.13.3 DS3 BERTS (Receiver Measurement)



```
DS3 BERTS
■Cbit/p Errors                  ■Cbit/p Errors
        total=          563             total=          563
    error sec=           12         error sec=           12
   error rate=       1.00-6        error rate=       1.00-6

Use up/down for more results                       17:32:16
```

Select the DS3 BERTS Receiver Measurement Results **page** to see the results of the DS3 measurements and measurement analysis. The Measurement Results **page** has a split screen so that you can see two sets of results simultaneously. Both the left and right display fields show DS3 results when the green **DS3 LED** above the **DS3/DS1 MEASUREMENT Results key** lights.

To see DS1 measurement results, press the **DS3/DS1 MEASUREMENT Results** key until the green **DS1 LED** lights. When both LEDs light, the LCD shows DS3 measurements results on the left side of the LCD and DS1 measurement results will be on the right side.

To get the available measurement results:

- Use ▶/◀ keys to move the ■ to the left or right display field.
- Use ▲/▼ keys to scroll through the measurement results.

Two factors control the measurement results which appear on the LCD:

- measurement validity
- display configuration

Only valid measurements will appear on the Measurement Results **page**.

- For example, febe measurement results will not appear when the incoming DS3 signal is formatted using the Standard M13 framing format because febe is not a valid measurement for M13 formatted signals.
- The types of measurements which appear on the DS3 Measurement Results **page** is configured on the DS3 Receiver Display **page** (see Section 5.4.3). When you select a partial display, only those measurement types that are selected in the display set up will be available for viewing.

ERROR TYPES

bit	A bit error second is counted when an incoming data bit (excluding any framing bits) does not match the value predicted by the selected pattern[1].
bpv	A bipolar violation (bpv) is counted when: • two consecutive data ones have the same polarity, and • a valid zero substitution is not detected.
fbit	A F–bit error is counted when an incoming framing bit does not match the value predicted for the selected frame type.
parity	A parity error is counted when the parity value extracted from the parity bits does not match the parity value calculated for the previous frame.
cbit/p	The AT 9500 counts a C–bit parity error when: • framing type is C–bit parity (CPAR), and • parity value extracted from the CPAR bits does not match the parity value calculated for the previous frame. A C–bit error occurs when: • framing type is M13, and three C–bits within a subframe differ.
febe	A Far End Block Error (febe) can happen when: • framing type is C–bit parity (CPAR), and • three febe bits within a superframe are not all set to one.

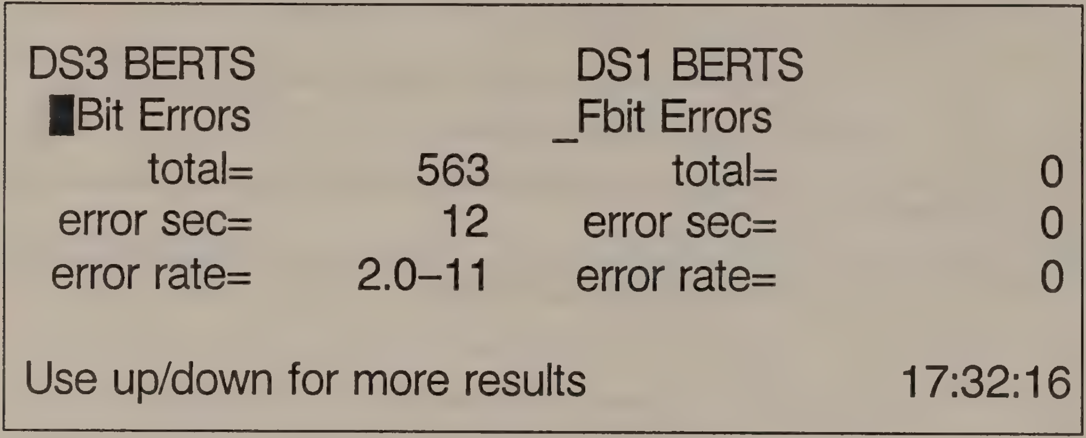
MEASUREMENT/ANALYSIS CATEGORIES

You can find the definitions of total, error sec, error rate, %error free, %error sec, consec ses, dribbling es, bursty es and severely es in Section 5.4.3 (DS3) or 5.4.8 (DS1).

---

[1] The particular errors that the test set counts are controlled in the test set up. You may select from bit, bpv, F–bit and crc6.

5.13.4 DS1 BERTS/DS3 BERTS (Receiver Measurement)



```
DS3 BERTS                        DS1 BERTS
 █Bit Errors                     _Fbit Errors
        total=          563             total=        0
    error sec=           12         error sec=        0
   error rate=      2.0–11         error rate=        0

Use up/down for more results                   17:32:16
```

Select the split DS3/DS1 BERTS Measurement Results **page** to see both DS3 and DS1 measurements and measurement analysis. When both the green **DS3** and **DS1** LEDs above the **DS3/DS1 MEASUREMENT Results** key light, the LCD shows DS3 measurement results on the left side and DS1 measurement results on the right side. For more information on the DS3 and DS1 measurement results, see Section 5.4.2 (DS3) and Section 5.4.7 (DS1).

To see the measurement results:

- use the ▶/◀ keys to move the ■ to the left or right display field
- use the ▲/▼ keys to scroll through the available measurement results.

ERROR TYPES

The error types definitions for DS3 are located in Section 5.4.3. The error type definitions for DS1 are located in Section 5.4.8.

MEASUREMENT/ANALYSIS CATEGORIES

Section 5.4.2 contains the error measurement/analysis definitions for DS3. Section 5.4.7 includes the measurement/analysis definitions for DS1.

5.13.5 DS1 STATUS (Input Status)

```
DS1 STATUS:          OOF LOS  LOP  A1S YEL   0's
  #Seconds :           2   0    2    0   0    0
  #Occurred:          11   0    8    0   0    0

  ■Input    _Data Channel   _Freq (1.544025)
   mode:  los              excess 0's:  no
   pattern:  none          DS1 from:  external
```

Select the DS1 Status page to see the current operating status and the detected errors for the DS1 Receiver. The top part of the Status display contains error status information accumulated during a test. This status information provides both:

- number of seconds in which a particular operating status condition is detected
- number of times that the AT 9500 detected the operating status condition.

When a test is not in progress, the values displayed in the top part of the Status display are the totals from the previous test. The bottom part of the Status display shows the current operating information about the DS1 Receiver.

The Input Status shows the current frame, coding, and pattern which the AT 9500 is detecting. The page also gives a current indication of excess zero conditions, and it reveals the source of the DS1 signal. To see the other Status information (Data Channel and Frequency), use the ◀/▶ keys to position the ■ in the Status field of interest.

TEST STATUS

OOF An Out Of Frame (OOF) second is counted for each second in which a:

- DS1 frame lock is not continuously maintained, or
- Signal Loss (LOS) condition occurs.

LOS	A Loss Of Signal (LOS) second is counted for each second in which: • the selected DS1 signal source is external and • no signal is detected at the **DS1 RX** jack, or • frequency of the input signal is outside DS1 specifications.
LOP	A Loss Of Pattern (LOP) second is counted for every second in which: • DS1 pattern lock is not continuously maintained or • LOS condition occurs.
A1S	An All Ones (A1S) second is counted for each second in which: • at least one superframe (or the equivalent number of bits for unframed data) is detected with greater than 99% of the total number of data bits a data one. • The test set excludes overhead bits (framing and crc6) from the evaluation when the DS1 signal is framed.
YEL	A DS1 yellow alarm (YEL) second is counted for each second in which it detects: • SF or SLC96 framing and at least one superframe is detected in which bit 2 of each channel is zero at least 99% of the time, or • ESF framing and the yellow alarm pattern (11111111 00000000) is detected in the 4 kilobyte/second data (signaling) link.
0'S	An excess zeros (0's) alarm second is counted for each second in which 16 or more consecutive zeros are detected (eight consecutive zeros in ESF).

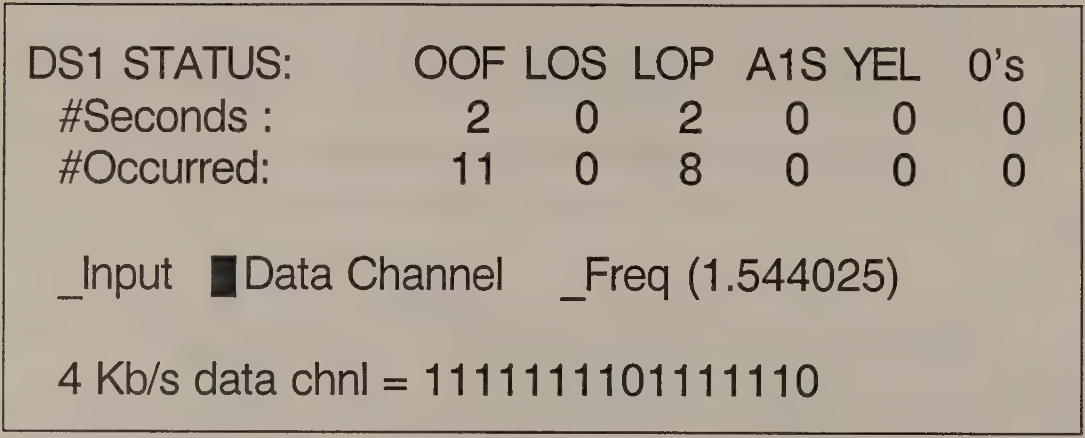
DS1 INPUT STATUS

MODE	Indicates the current frame type (unframed, sf, esf, slc96) and code type (ami, b8zs) of the DS1 input signal. Note that code type does not apply for demultiplexed DS1 input signals.
frame = oof	Indicates unframed (out of frame) DS1 data are being received. When the receiver is in unframed mode, all data is used for pattern analysis.
sf	Indicates superframe (sf) framing formatted data is being received. When receiving an SF framed signal, framing bits are stripped from the data before performing a pattern analysis. The test set analyzes framing bits for F-bit error information.
esf	Indicates extended superframe (esf) formatted data are being received. When an esf framed signal is received, the AT 9500: • removes overhead bits (framing, crc6, 4 kilobyte/second link) from the data before performing pattern analysis. • analyzes the framing bits for F-bit error information. • analyzes C-bits for crc6 error information.

- analyzes the data bits which make up the 4 kilobyte/second data (signaling) link for signaling information, which is displayed on the Status Data Channel page.

slc	Indicates the test set is receiving Subscriber Loop Carrier (SLC96)–formatted framing data. When a SLC96 framed signal is received, the AT 9500: • removes overhead bits (framing and terminal data link) from the data before performing pattern analysis. • analyzes the framing bits for F–bit error information.
CODE =	
ami	Indicates the received input signal is encoded using Alternating Mark Inversion (AMI). Coding is not applicable for DS1 signals demultiplexed from a DS3 signal.
b8zs	Indicates the received input signal is encoded using Bipolar 8 Zero Suppression (b8zs) coding. Coding is not applicable to DS1 signals which are demultiplexed from a DS3 signal.
PATTERN	Indicates the current pattern type of the DS1 input signal.
prbs #	The received data pattern is a pseudo random bit sequence. The # field can be: 23 (2e23 –1) 20 (2e20 –1) 15 (2e15 –1) 11 (2e11 –1) 9 (2e9 –1) 6 (2e6 –1)
rpt #	The received data pattern is a repeating pattern of length #. The # field can be 13 – 24. Repeating patterns of length less than 13 are displayed using an even multiple (for example, a 11 bit pattern will be displayed as rpt 22).
yel	The received signal contains a yellow signal with no detected data pattern.
yprb #	The received signal contains both a yellow signal and a prbs pattern.
yrpt #	The received signal contains both a yellow signal and a repeating pattern.
a1s	The received signal contains an all ones signal.
EXCESS O's	Indicates that 16 or more consecutive zeros (8 consecutive zeros in ESF) are detected in the DS1 input signal.
DS1 FROM	Indicates the source of the evaluated DS1 signal. • If the signal source is the external **DS1 RX** jack, the field reads "external" • If the signal source is the DS3/DS1 demultiplexer, the field reads "dmux n". n is the channel number of the extracted DS1.

5.13.6 DS1 STATUS (Data Channel)



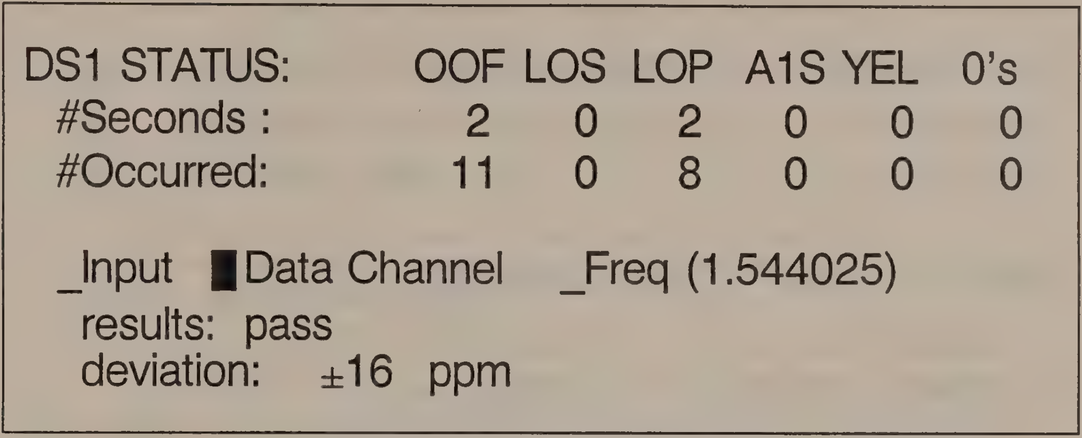
```
DS1 STATUS:          OOF LOS  LOP  A1S YEL   0's
  #Seconds :           2    0    2    0    0    0
  #Occurred:          11    0    8    0    0    0

  _Input  █Data Channel    _Freq (1.544025)

  4 Kb/s data chnl = 1111111101111110
```

Select the DS1 Data Channel Status page to see the current operating status and the detected errors for the DS1 Receiver. The top part of the Status screen shows error information accumulated during a test (see Section 5.13.5 for details).

The bottom part of the Data Channel Status screen shows the current operating status of the extended superframe (ESF) 4 kilobyte/second data (signaling) link.

- When the test set receives valid signaling information on the 4 kilobyte/second link (11111111 0xxxxxx0), the data will be displayed in the signal channel field.
- When the test set receives no valid signaling information, the signal channel field indicates "none".
- When non-ESF framing (or no framing) is present on the DS1 signal, the signal channel field indicates "n/a".

5.13.7 DS1 STATUS (Frequency Status)

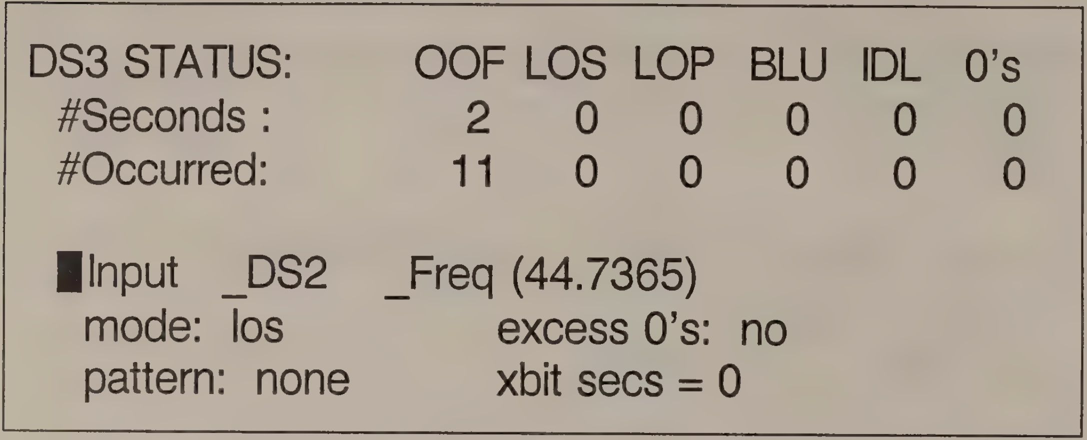


```
DS1 STATUS:          OOF LOS  LOP  A1S YEL   0's
  #Seconds :           2   0    2    0   0    0
  #Occurred:          11   0    8    0   0    0

  _Input  █Data Channel   _Freq (1.544025)
    results:  pass
    deviation:    ±16   ppm
```

Select the DS1 Frequency Status page to view the current operating status and the operating frequency of the DS1 Receiver. The top part of the Status display contains status information which is accumulated during a test (see Section 5.13.5 for details).

The bottom part of the Frequency Status page shows the measured frequency of the DS1 input signal and the deviation from the specified DS1 center frequency (1.544000 MHz). The frequency measurement feature is part of the test set Signal Analysis Option. When the Signal Analysis option is not installed in the AT 9500, the frequency field indicates "n/a".

5.13.8 DS3 STATUS (Input Status)



```
DS3 STATUS:        OOF  LOS  LOP  BLU  IDL  0's
  #Seconds :         2    0    0    0    0    0
  #Occurred:        11    0    0    0    0    0

  █Input   _DS2   _Freq (44.7365)
   mode:  los            excess 0's:  no
   pattern:  none        xbit secs = 0
```

Select this page to view the current operating status of the DS3 Receiver. The top half of the page contains status information accumulated during a test. This status information gives both the:

- number of seconds in which the AT 9500 detects a particular status condition
- number of times that the status condition occurred.

When a test is not in progress, the values displayed in the top part of the Status page are totals for the previous test. The bottom half of the Status page contains the signal characteristics of the current input to the DS3 Receiver. The Input Status shows the:

- current framing and pattern which the AT 9500 is detecting.
- current signal level selected for DS3 receiver function.
- current indicator of excess zero condition.
- current indicator of the X-bit alarm condition.

To see other available Status information (DS2 and Frequency), use the ◀/▶ keys to position the ■ in the DS2 or Misc field.

TEST STATUS

OOF Counts an Out Of Frame (OOF) second when:

- the DS3 frame lock is not continuously maintained or
- a Signal Loss (LOS) condition occurs.

LOS	Counts a Loss Of Signal (LOS) second for each second in which: • no signal is detected at the DS3 RX jack, or • the frequency of the input signal is outside the DS3 specifications.
LOP	A Loss Of Pattern (LOP) second is counted for each second in which: • DS3 pattern lock is not continuously maintained or • LOS condition occurs.
BLU	A BLUE signal second is counted for each second where at least one superframe is detected with greater than 99% of the total number of data bits consisting of an alternating one–zero pattern in the payload data (1010...).
IDL	An IDLE signal second is counted for each second where at least one superframe is detected with greater than 99% of the total number of data bits consisting of an alternating double one–zero pattern in the payload data (11001100...) with the first data following each overhead bit.
0'S	An Excess Zeros (0's) alarm second is counted for each second in which three or more consecutive zeros are detected.

DS3 INPUT STATUS

MODE	Indicates the current frame type (unframed, m13, cpar) and level (high, dsx/low) of the DS3 input signal.

FRAME =

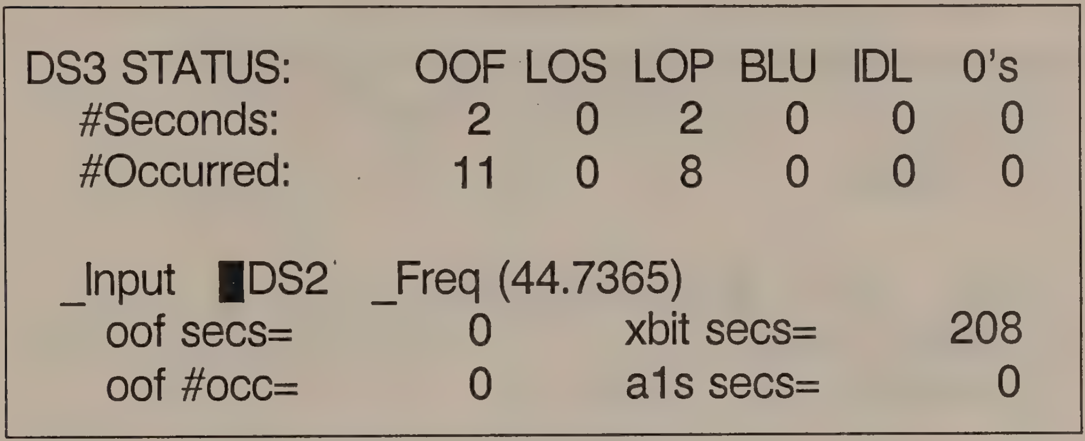
oof	Unframed (OOF) DS3 data are being received. When the receiver is in OOF mode, the test set uses all data for pattern analysis.
m13	Indicates standard M13 framing formatted data is being received. When an M13 framed signal is received, the test set removes the overhead bits (framing, parity, C–bits, X–bits) from the data before performing the following pattern analysis. • framing bits are analyzed for F–bit error information • parity bits are analyzed for parity error information • C–bits are analyzed for cbit error information, and • X–bits are evaluated for Xbit status.
cpar	Indicates the AT 9500 is receiving C–bit Parity (CPAR) framing formatted data. When a CPAR framed signal is received, the AT 9500 removes the overhead bits (framing, parity, cbits, xbits) from the data before the performing the following pattern analysis. • framing bits are analyzed for F–bit error information

- parity bits are analyzed for parity error information
- C–bits are analyzed for cbit error information, and
- X–bits are evaluated for Xbit status.

LEVEL =

high	Indicates the DS3 Receiver level selection is set to receive a high level signal. To change to dsx/low level, push the DS3 RCVR key and select **dsx/low** on the Modes **page** (see Section 5.4.2).
dsx/low	Indicates the DS3 Receiver level selection is set to receive a dsx or low level signal. If this is not correct, push the RCVR/THRU key and select high on the Modes **page** (see Section 5.4.2).
PATTERN	Indicates the current pattern type of the DS3 input signal.
prbs #	The received data pattern is a pseudo random bit sequence. The # field can be: 23 (2e23 –1) 20 (2e20 –1) 15 (2e15 –1) 11 (2e11 –1) 9 (2e9 –1) and 6 (2e6 –1).
rpt #	The received data pattern is a repeating pattern of length #. The # field can be 13 – 24. Repeating patterns of length less than 13 will be displayed using an even multiple (for example, an 11 bit pattern will be displayed as rpt 22).
blue	The received signal contains a BLUE signal.
idle	The received signal contains an IDLE signal.
a1s	The received signal contains an all ones signal.
EXCESS O's	Indicates 3 or more consecutive zeros are being detected in the DS3 input signal.
XBIT SEC	Counts an X–bit Alarm second for each second in which the Xbit alarm condition is detected in the DS3 input signal (alarm condition: Xbit = 0).

5.13.9 DS3 STATUS (Dropped DS2 Status)



```
DS3 STATUS:          OOF LOS  LOP  BLU  IDL   0's
  #Seconds:            2   0    2    0    0     0
  #Occurred:          11   0    8    0    0     0

 _Input  ■DS2  _Freq (44.7365)
   oof secs=          0       xbit secs=      208
   oof #occ=          0       a1s secs=         0
```

Displays the current operating status of the DS3 Receiver. The top half of the page contains status information accumulated during a test (see Section 5.13.8 for details). The bottom half of the page contains the current status of the DS2 Receiver. The DS2 receiver is used for DS3/DS1 demultiplexing. The DS2 Status gives a current indicator of:

- DS2 Out of Frame (OOF) condition
- DS2 status information accumulated during a test (OOF, Xbit Alarm, A1S).

The DS2 test status information is the number of seconds the AT 9500 detects a particular status condition. When no test is in progress, the values displayed in the DS2 test status (OOF seconds, Xbit Alarm, A1S) part of the Status display are totals from the previous test.

To see the other Status information (Frequency and Input), use the ▶/◀ key to move the ■ to the Status field of interest.

DS2 TEST STATUS

OOF Counts an Out Of Frame (OOF) second for each second that:

- DS2 frame lock is not continuously maintained or
- Signal Loss (LOS) or Frame Loss (OOF) condition occurs on the DS3 input signal.

A1S Counts an All Ones (A1S) second for each second in which at least one superframe (or the equivalent number of bits for unframed data) is detected where greater than 99% of the total number of data bits are data ones. Overhead bits (framing, C–bits and X–bits) are excluded from the evaluation when the DS2 signal is framed.

XBIT SEC Counts an Xbit Alarm second for each second in which the Xbit alarm condition is detected in the DS2 signal (alarm condition: Xbit = 0).

5.13.10 DS3 STATUS (Frequency Status)

```
DS3 STATUS:         OOF  LOS  LOP  BLU  IDL   0's
   #Seconds:          2    0    2    0    0     0
   #Occurred:        11    0    8    0    0     0

  _Input   _DS2   █Freq (44.7365)
     results:  pass
     deviation:  +10     ppm
```

Displays the current operating status of the DS3 Receiver. The top half of the page contains status information accumulated during a test (see Section 5.13.8 for details).

The bottom half of the page shows the measured frequency of the DS3 input signal and the deviation from the specified DS3 center frequency (44.7365 MHz). The frequency measurement function is part of the Signal Analysis Option. When the Signal Analysis option is not installed, the frequency field indicates "n/a".

CHAPTER 6

REMOTE INTERFACE OPERATION – ADDITIONAL DETAILS

This chapter describes controller operation of the AT 9500. A description of each of the communication ports is provided to help you understand the remote operating features of the test set.

GENERAL PURPOSE INTERFACE BUS (GPIB)

The AT 9500 provides full GPIB interface capability in accordance with IEEE STD–488. The interface can be set up as either a talker/listener or in a talker only mode. Table 6.1 lists the GPIB capability codes for the AT 9500 along with their definition.

Before trying to use the IEEE–488 Interface, you must select an appropriate address. The following section tells you how to select and set the GPIB address using the rear panel switches. If you are using the IEEE–488 Interface for remote control of the AT 9500, set up the test set as a talker/listener. Set the GPIB Talk Only switch on the Rear Panel of the AT 9500 to the OFF position.

If you use the IEEE–488 Interface to drive a printer or some other data recording device, set up the unit as a talk only device. Set the GPIB Talk Only switch on the Rear Panel of the AT 9500 to the OFF position.

NOTE

To use the GPIB as a Talk Only device, it must be set up as the PRINTER. See Section 5.7.4 to find out how to set up the Printer at the front panel.

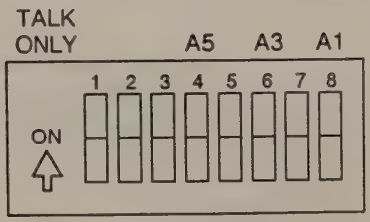
CONNECTING THE AT 9500 TO THE IEEE–488 INTERFACE BUS

The electronics necessary to connect the test set to the IEEE–488 General Purpose Interface Bus (GPIB) are part of the Real Time Clock Assembly installed in the basic test set. Connecting the AT 9500 to the GPIB requires a cable from the remote controller to the IEEE–488 connector on the rear panel. Set the bus address with switches A1 through A5. Note, A2 and A4 are not silk–screened on the rear panel. Use the chart below to select and set the address.

BUS ADDRESS (NOTE 1)		SWITCH NUMBER				
HEX	DEC	4	5	6	7	8
01H	01	0	0	0	0	1
02H	02	0	0	0	1	0
03H	03	0	0	0	1	1
04H	04	0	0	1	0	0
05H	05	0	0	1	0	1
06H	06	0	0	1	1	0
07H	07	0	0	1	1	1
08H	08	0	1	0	0	0
09H	09	0	1	0	0	1
0AH	10	0	1	0	1	0
0BH	11	0	1	0	1	1
0CH	12	0	1	1	0	0
0DH	13	0	1	1	0	1
0EH	14	0	1	1	1	0
0FH	15	0	1	1	1	1
10H	16	1	0	0	0	0
11H	17	1	0	0	0	1
12H	18	1	0	0	1	0
13H	19	1	0	0	1	1
14H	20	1	0	1	0	0
15H	21	1	0	1	0	1
16H	22	1	0	1	1	0
17H	23	1	0	1	1	1
18H	24	1	1	0	0	0
19H	25	1	1	0	0	1
1AH	26	1	1	0	1	0
1BH	27	1	1	0	1	1
1CH	28	1	1	1	0	0
1DH	29	1	1	1	0	1
1EH	30	1	1	1	1	0
1FH	31	1	1	1	1	1

NOTES:

1. SWITCH POSITIONS 1,2,3 MUST BE SET TO "0,0,0" FOR "TALK/LISTEN MODE" OR TO "1,0,0" FOR "TALK ONLY MODE."
2. THESE COLUMNS IDENTIFY THE BUS ADDRESS IN BOTH HEXIDECIMAL AND DECIMAL.



1 = Switch ON
0 = Switch OFF

Table 6.1
AT 9500 GPIB Capability Codes

Code	Description
SH1	Complete source handshake capability
AH1	Complete acceptor handshake capability
T5	Basic talker, serial poll, talk only, unaddress if MLA
L4	Basic listener, unaddress if MLA
SR1	Complete service request capability
RL1	Complete Remote/Local Service
PP2	Local parallel poll configure
DC1	Complete device clear capability
DT1	Complete device trigger capability
C0	No controller capability
E1	Open collector drives

HOW TO USE THE SERIAL COMMUNICATION FACILITIES

The AT 9500 provides two RS-232 ports, COM1 and COM2. COM1 is the primary Remote Serial Interface for the test set. It consists of a 25-pin RS-232C female D-type connector located on the Rear Panel, see Figure 6.1. The connector is set up as Data Communications Equipment (DCE). You can connect a data terminal equipment (DTE) directly to the COM1 port with a standard RS-232 cable. If you want to connect another piece of DCE to the AT 9500 COM1 port, use an adapter cable or null modem.

COM2 is the primary Serial Printer Interface for the AT 9500. It consists of a 9-pin PC-AT compatible male connector located on the Rear Panel, see Figure 6.1. The connector is set up as DTE. Connect a serial printer directly to the COM2 port using the cable provided as part of the AT 9500 Serial Printer Option.

Both COM1 and COM2 ports can be connected to a variety of RS-232 compatible devices with the proper configuration and cables. Tables 6.2 and 6.3 have the signal pin definition for COM1 and COM2 respectively. Programmable set up information (baud rate and hardware handshake) can be selected using the System Utilities Comm Setup page (see Section 5.7.3).

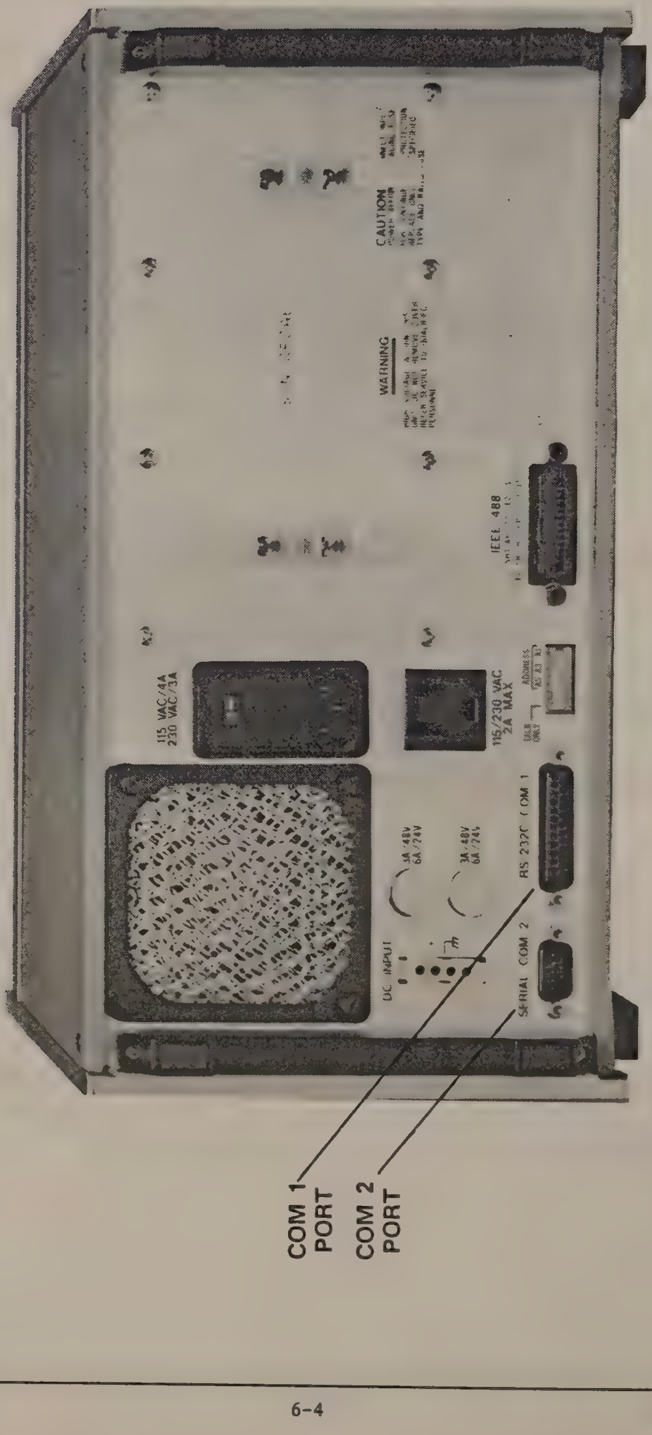


Figure 6.1. AT 9500 Rear Panel

Table 6.2
COM1 RS-232 Interface Definition

Function:	DCE (Data Communications Equipment)
Baud rate:	9600, 4800, 2400, 1200, 300
Word Length:	8 bits
Parity:	none
Line Terminator:	CR (carriage return), CRLF (carriage return/line feed)
Handshake:	3 wire (XON/XOFF), hardware (DTR/DSR and XON/XOFF)

Pin	Name	Description
1	PROT GND	chassis ground
2	TX DATA	This signal line provides serial input data to the AT 9500.
3	RX DATA	This signal line provides serial output data from the AT 9500.
4	RTS	The AT 9500 terminates this signal.
5	CTS	The AT 9500 sets this signal to a logic high after completing the initialization procedure (at power up).
6	DSR	This signal is set high after the AT 9500 completes the initialization procedure (at power up).
7	SIG GND	signal ground
8	CD	This signal is connected to DTR through a 2.2 kΩ resistor.
20	DTR	This signal provides a terminal ready indicator for the AT 9500. When DTR is high, the AT 9500 will output data (when available). When DTR is low, the AT 9500 will not provide the requested data output (even if data are available and/or). Please note that the AT 9500 only monitors DTR when you have enabled the COM1 Hardware Handshake.

Table 6.3
COM2 RS-232 Interface Definition

Function:	DTE (Data Terminal Equipment)
Baud rate:	9600, 4800, 2400, 1200, 300
Word Length:	8 bits
Parity:	none
Line Terminator:	CR, CRLF
Handshake:	3 wire (XON/XOFF), hardware (DTR/DSR and XON/XOFF)

Pin	Name	Description
1	CD	This signal connects to +5V through a 2.2 kΩ resistor.
2	RX DATA	This signal line provides serial input data to the AT 9500.
3	TX DATA	This signal line provides serial output data from the AT 9500.
4	DTR	The AT 9500 sets this signal to a logic high after completing the start-up procedure (at power up).
5	SIG GND	signal ground
6	DSR	This signal provides a data set ready indicator for the AT 9500. When the DSR is at logic low, the AT 9500 will not output data (even if data are available and/or) requested. Note the DSR signal is only monitored when COM2 Hardware Handshake is enabled.
7	RTS	The AT 9500 sets this signal to a logic high after completing the initialization procedure (at power up).
8	CTS	The AT 9500 terminates this signal.
9	RI	This signal is connected to –5.2V through a 2.2 kΩ resistor.

X

CONTROLLER OPERATION OF THE AT 9500

The AT 9500 has two computer interfaces which are capable of providing controller operation of the test set (COM1 RS-232 port and GPIB port). The command and reporting structure for the AT 9500 controller operation functions is identical for either port. There are a number of features which are built into the AT 9500 controller operation to provide easy, user-friendly operation.

The AT 9500 Remote Controller Command/Report structure is compatible with other test sets in the Scientific-Atlanta AT 9000 family of products. Each system contains a number of independent test functions (such as DS3 Transmitter and DS1 Receiver/DMUX) which can be independently addressed and configured. The function addressing scheme is consistent within the AT 9000 family, so user-developed remote interface software may be reused.

The commands are English Language oriented, and most of the commands are recognized by abbreviations (for example, the ERRORS command can be entered as ERR). This allows you to first learn the commands based on the common English names, and later, to use the abbreviated commands for quicker key entry.

Each time you issue a command to a particular function (for example, DS3 Receiver – DS3-RX):

- that function becomes the currently addressed function, and
- additional commands to the same function can be entered without repeating the address field.

If the Serial Interface is used, the AT 9500 provides a user prompt which includes the currently addressed function, allowing you to immediately know which function is currently addressed.

The Serial (RS-232) Interface provides Echo capability for easy use with dumb terminals. Echo also allows simple prompts and error messages.

The general form for Remote Operation commands in the AT 9500 is:

```
COMMAND_NAME  <address>  <parameter list>
```

For example, to set up the DS1 transmitter for ESF (extended superframe) framing enter:

```
FRAME DS1-TX ESF
```

where FRAME is the COMMAND NAME,
DS1-TX is the <address> and
ESF is the entry from the <parameter list>.

Another example would be to insert parity errors at the rate of 1.00E–06 in the DS3 Transmitter output, enter:

```
ERRORS DS3–TX PARITY BER 1E–6
```

where ERRORS is the COMMAND NAME,
DS3–TX is the <address>,
BER is the entry from the <parameter list>,
and 1E–6 represents the rate to insert the errors.

or if the DS3 Transmitter is already addressed, the command could be entered as:

```
ERR PAR BER 1E–6
```

where ERR is the COMMAND NAME (abbreviated),
the <address> was set previously,
BER is the entry from the <parameter list>,
and 1E–6 represents the rate to insert the errors.

Table 6.4
Remote Controller Command Quick Reference

Command Name	Function	Description
ADDR	system	Select function to address.
ALARMS-RST	receiver	Clear report alarm field.
BYE	system	Logout.
CLOCK	transmitter	Select clock source for transmitter.
CMD-ERROR	system	Sends error report to remote user.
CODE	receiver transmitter	Select output encoding for thru data. Select output encoding for output data.
DATE	system	Set current date.
DCL	system	Clear remote and printer output buffers.
DELETE	system receiver transmitter	Delete preset panel. Delete preset receiver panel. Delete preset transmitter panel.
DMUX	receiver	Select demultiplexed channel number.
DIR	system	Request for system configuration.
ECHO	system	Serial communications echo enable.
ERRORS	receiver transmitter	Insert errors in thru data signal. Insert errors in transmitted signal.
ERR-BEEP	system	Audible alarm for detected Severely Errored Second.
ERR-SEC	system	Select error second algorithm.
FACILITY	receiver	Accesses a 20-character field on report printouts.
FRAME	transmitter	Select AT 9500 transmitter output framing.
HELLO	system	Log on.
HIST-RST	system	Clears front panel alarm history LEDs.
INPUT	receiver	Selects DS1 input signal source (demux from DS3 or DS1 RX front panel jack).
INST-RST	system	Perform an instrument reset, restores the AT 9500 to the factory defaults.

Table 6.4 – (continued)

Command Name	Function	Description
LEVEL	receiver transmitter	Set receiver input signal level. Set transmitter output signal level.
LLO	system	Local lockout disables local keys on the front panel.
LOCAL	system	Restores front panel control to the AT 9500.
LOCATION	system	Select location ID (1 – 10 characters).
LOOPBACK	transmitter	Activates special signaling data for DS1.
LOOPCODE	transmitter	Selects special signaling data for DS1.
NVR	system	Update non–volatile RAM information.
PATTERN	transmitter	Select output data pattern.
PRESETS	system	Displays available preset panel selections.
PREFERENCE	receiver	Selects DS3 frame type for when DS3 signals are received.
PRINT	receiver	Activates report to printer port.
PRINT–DEV	system	Assigns an output device as printer port.
RECALL	system	Recall an available preset panel.
REMOTE	system	Causes the remote terminal to control the AT 9500.
REMOTE–DEV	system	Sets up the remote device output mode.
REPORT	receiver	Select report format.
RERUN	system	Restarts a currently programmed test.
RESULTS	receiver	Request for the AT 9500 to send the results report to remote port.
RUN	system	Start test.
SAVE	system	Save the current AT 9500 set up in a preset panel.
SET–DISPLAY	receiver	Sets up the AT 9500 front panel display data.

Table 6.4 – (concluded)

Command Name	Function	Description
SET-RESULTS	receiver	Sets up the results report data.
SETUP	receiver	Request for AT 9500 function set up transmitter information (see SYS).
SQUELCH	system	Selects the report data suppression algorithm.
STATUS	receiver	Request for test status information.
STOP	system	Stops the AT 9500 test in progress.
SUMMARY	receiver	Request for Summary report.
SYS	system	Request for system function setup information (see SETUP).
TEST-TYPE	system	Selects the type of test the AT 9500 will run.
THRESHOLDS	receiver	Selects error thresholds for AT 9500.
THRU	receiver	Select type of processing the AT 9500 will perform on thru data.
TIME	system	Sets the time of day for reports.
TIMELINE	system	Select 15 minute confidence time report.
TIMER	system	Select test time for all functions (AT 9500 only).
TIMER	receiver	Select test time for addressed function.
TX-BUSY	transmitter	Set/Clear busy flag for addressed transmit function.
XBIT	transmitter	Set/Clear Xbit in DS3 output data.
YELLOW	transmitter	Activates yellow alarm signal data for DS1.
ZERO	system	Select zero suppression for DS1.

name: ADDR

abstract: ADDR <parameter>

type: system command

description: Use this command to select a function by address. Once an address is selected, additional commands to the same function do not require an address parameter.

NOTE

system commands do not require an address.

parameters: The parameter selections for the AT 9500 ADDR command are:

- DS3-TX (DS3 Transmitter)
- DS3-RX (DS3 Receiver)
- DS3-SA (DS3 Signal Analysis Option)
- DS1-TX (DS1 Transmitter)
- DS1-RX (DS1 Receiver)
- DS1-SA (DS1 Signal Analysis Option)

or, optionally

- 1-TX1 (DS3 Transmitter)
- 2-RX1 (DS3 Receiver)
- 3-SA1 (DS3 Signal Analysis Option)
- 1-TX2 (DS1 Transmitter)
- 2-RX2 (DS1 Receiver)
- 3-SA2 (DS1 Signal Analysis Option).

example: ADDR 2-RX1

name: ALARMS-RST

abstract: ALARMS-RST <address>

type: receiver command

description: This command resets the alarms field of both the printer and remote reports for the addressed receiver function.

address: The address selections for the AT 9500 ALARMS-RST command are:

- DS3-RX (DS3 Receiver)
- DS1-RX (DS1 Receiver)

or, optionally

- 2-RX1 (DS3 Receiver)
- 2-RX2 (DS1 Receiver).

example: ALARMS-RST 2-RX2

name: BYE

abstract: BYE (no parameter)

type: system command

description: The BYE command is a logoff function which clears the current function address and disables automatic reporting over the Remote port.

name: CLOCK

abstract: CLOCK <address> <parameter>

type: transmitter command

description: Use this command to select the clock source for the addressed transmit function.

NOTE

When no independant receiver signal exists, selecting loop-timed operation will disable the Transmit function of the AT 9500.

address: The valid addresses for the AT 9500 CLOCK command are:

- DS3-TX (DS3 Transmitter)
- DS1-TX (DS1 Transmitter)

or, optionally

- 1-TX1 (DS3 Transmitter)
- 1-TX2 (DS1 Transmitter).

parameters: The valid parameters for the AT 9500 CLOCK command are:

LOOP-TIMED - Choosing LOOP-TIMED for the DS3 Transmitter causes the AT 9500 to recover the DS3 input clock (DS3 RX jack) to use as a clock source for DS3 output processing (DS3 RX1-3).

Choosing LOOP-TIMED for the DS1 Transmitter causes the AT 9500 to recover the DS1 input clock (DS1 RX jack) to use as a clock source for DS1 output processing.

INTERNAL - The timing is controlled by the AT 9500 internal oscillators.

example: CLOCK 1-TX2 LOOP-TIMED

name: CMD-ERROR

abstract: CMD-ERROR (no parameter)

type: system command

description: Send operator errors to the requesting remote device. The AT 9500 will respond with a report on the last operator error (most recent) and the first operator error (oldest) which have been detected since the previous CMD-ERROR command was issued.

name: CODE

abstract: CODE <address> <parameter>

type: transmitter command, receiver command (drop/thru output)

description: Use this command to choose the type of encoding which the addressed DS1 function will use. For the Receiver function, the code selection determines the encoding used for the drop/thru output.

address: The address selections for the AT 9500 CODE command include:
  DS1-RX (DS1 Receiver)
  DS1-TX (DS1 Transmitter)
or, optionally
  2-RX2 (DS1 Receiver)
  1-TX2 (DS1 Transmitter).

parameters: The parameter selections for the CODE command are:
  AMI (alternating mark inversion)
  B8ZS (bipolar 8 zero suppression).

example: CODE 2-RX2 B8ZS

name:	DATE
abstract:	DATE <month/day>
type:	system command
description:	Sets the date.
month/day:	The month/day parameters for the AT 9500 DATE command are: month = 01,..,12 day = 01,..,31
example:	DATE 05/30

name:	DCL
abstract:	DCL (no parameters)
type:	system command
description:	The Device Clear (DCL) command clears queued reports for communication devices (COM1, COM2, GPIB). This command can be used to clear unwanted test reports before beginning a new test.

name:	DELETE
abstract:	DELETE <address> <name>
type:	system command
description:	This command deletes the named preset panel for the addressed function. To get a list of the existing preset panels for a particular address, use the PRESET command.
address:	The address selections for the AT 9500 DELETE command include: ALL (complete AT 9500 functional setup) EZ-ON (front panel lockout function)
name:	The name selection for the AT 9500 DELETE command is a 1-8 character string.
example:	DELETE ALL SYSTEST

name:	DIR
abstract:	DIR (no parameter)
type:	system command
description:	The DIR command provides a directory of the functions which are installed in the AT 9500. The directory provides a list of functions and the addresses which can be used to access each function. To access the command processing for a particular function, use the ADDR command. The following figure shows a sample response to the DIR command from a remote terminal.

```
REMOTE>DIR

--------------------------------------------------------------------------------
             Scientific-Atlanta Digital Transmission Analyzer 1988
                        DIRECTORY OF ANALYSIS FUNCTIONS
--------------------------------------------------------------------------------
Slot#   Function      Address  Status   Slot#   Function      Address   Status

  1                                        2
    DS3 TRANSMITTER.....1-TX1  avail        DS3 RECV/DMUX/THRU..2-RX1   avail
    DS1 TRANSMITTER.....1-TX2  avail        DS1 RECV/DMUX/THRU..2-RX2   avail
```

Sample Output – Remote Command Response, DIR

REMOTE COMMAND LIBRARY **DMUX**

name:	DMUX
abstract:	DMUX <address> <channel number>
type:	receiver command
description:	The DMUX command determines the channel which will be demultiplexed from the signal source at the addressed function. When addressing DS3–RX, the channel number indicates which DS1 channel will be demultiplexed from the DS3 RX Input. When addressing DS1–RX, the channel number indicates which DS0 channel will be demultiplexed from the DS1 source (either external or demultiplexed from DS3).
address:	The address selections for the AT 9500 DMUX command are: DS3–RX (DS3 Receiver) DS1–RX (DS1 Receiver) or, optionally 2–RX1 (DS3 Receiver) 2–RX2 (DS1 Receiver)
channel numbers:	The channel numbers for a DS3 source are 1–28. The channel numbers for a DS1 source are 1–24.
example:	DMUX DS1–RX 22

name:	ECHO
abstract:	ECHO <parameter>
type:	system command
description:	Use ECHO to control the serial port hardware echo function. When ECHO is enabled (ECHO ON), the data which is received on the COM1 port will be echoed back to the source device.

NOTE

When ECHO is disabled (ECHO OFF), an RS-232 terminal set for full duplex operation will not display characters as they are entered on the keyboard.

parameters:	parameter = OFF, ON
example:	ECHO ON

name:	ERRORS
abstract:	ERRORS <address> <parameter1> <parameter2> <parameter3>
type:	receiver command, transmitter command
description:	Use this command to insert errors in an output data stream. For the Receiver functions, the selected errors will be inserted in the drop/thru output data stream. There are four error insertion operations in the AT 9500 (single, ber, burst, and 1/sf). Additionally, when you select single or ber (error rate) error insertion, there are three categories of errors which you can insert (pattern, frame, coding). INSERTING SINGLE ERRORS – You may insert single errors either for each error type (such as BIT errors) or some combination of error types. When inserting a combination of single errors, only one error type from each error category can be inserted. For example, if you insert single errors on a DS1 transmitter signal, the AT 9500 will insert one type of coding error (either BPV, CODE or COMBO), one type of framing error (either FBIT or CRC6), and one type of pattern error (BIT) at a time. To insert other coding or framing errors simply enter a second command.
example:	ERR DS1–TX BPV FBIT BIT INSERTING ERRORS AT A SPECIFIED ERROR RATE – To insert errors into the transmitter output function at a specified rate, use the following format: ERR <address> <parameter1> BER <parameter3>. Errors may be inserted for each error type (BPV, FBIT, BIT) at a specified rate by utilizing the BER (bit error rate) operation. In the ber operation, one error type can be inserted (selected using parameter1) at a specified error rate (selected using parameter3).
example:	ERR DS3–TX BIT BER 1E–6 INSERTING BURST ERRORS – An error burst can be inserted into the transmitter output data stream by using the burst error operation. When the AT 9500 generates a burst of errors, all of the output data of the addressed function is corrupted for the duration of the burst.
example:	ERR 1–TX1 BURST 10MS INSERTING 1/SF ERRORS – The AT 9500 can insert one data pattern error per superframe can with the 1/sf error command. This operation inserts a single bit error in each superframe after performing the parity (DS3) or crc6 (DS1 ESF) calculations:
example:	ERR 1–SF ON

name: ERRORS

abstract: ERRORS <address> <parameter1> <parameter2> <parameter3>

address: The parameter selections for the AT 9500 ERRORS command are:

- DS3–TX (DS3 Transmitter)
- DS3–RX (DS3 Receiver)
- DS1–TX (DS1 Transmitter)
- DS1–RX (DS1 Receiver)

or, optionally

- 1–TX1 (DS3 Transmitter)
- 2–RX1 (DS3 Receiver),
- 1–TX2 (DS1 Transmitter)
- 2–RX2 (DS1 Receiver).

parameter1: The selections available for <parameter1> include BURST, 1–SF, <error–type>. The error types (single, ber) which are valid for Transmitter functions are:

coding: BPV, CODE, COMBO
frame: FBIT, PARITY (DS3), CBIT (cbit–parity, DS3–CPAR), FEBE (DS3–CPAR), CRC6 (DS1–ESF)
pattern: BIT

The error types (single, ber) which are valid for Receiver functions are:

coding: BPV, CODE, COMBO
frame: FBIT, PARITY (DS3), CRC6 (DS1–ESF)

parameter2: The selections available for <parameter2> include:

for single errors: error type (as described above)
for ber: BER
for 1–SF: ON or OFF
for burst: FRAME, SF, 10MS, 100MS

parameter3: The selections available for <parameter3> include:

for single errors: error type (as described above)
for BER: error rate, XE–Z
(X and Z are integers)

name: ERR-BEEP

abstract: ERR-BEEP <parameter>

type: system command

description: This command enables/disables the audible alarm which beeps when the AT 9500 detects severely errored seconds (SES).

parameters: The parameter can be OFF or ON.

name: ERR-SEC

abstract: ERR-SEC <parameter>

type: system command

description: This command sets the criteria the AT 9500 uses to measure error seconds during a test.

parameters: The first of two available parameters for the ERR-SEC command is ASYNC (asynchronous). When you select the ASYNC error second option, the AT 9500 will use the system Real Time Clock (RTC) as the time reference to mark error second boundaries. This is similar to using your wristwatch as a reference to count error seconds. If an error occurs within a second, that second is called an error second.

The second parameter selection for ERR-SEC is SYNC (synchronous seconds).

When you choose the SYNC error second option, the AT 9500 will use the occurrence of an error event as the time reference to mark error second boundaries. This is similar to using a stopwatch as a reference to count error seconds. The timer starts after detecting the first error event, and continues to count as long as one or more error events occur in each consecutive time period (second). When a time period (second) elapses in which the AT 9500 detects no error event, the timer is stopped, and will not be restarted until the next error event is detected.

example: ERR-SEC ASYNC or ERR-SEC SYNC

name:	FACILITY
abstract:	FACILITY <parameter>
type:	receiver command
description:	Accesses a 20 character field on report printouts. In this field you can identify the facility being tested.
address:	The valid AT 9500 addresses for the FACILITY command are: DS3-RX (DS3 Receiver) DS1-RX (DS1 Receiver) or, optionally 1-RX1 (DS3 Receiver) 1-RX2 (DS1 Receiver).
parameters:	The parameters for this field are any 20 character string.
example:	FACILITY DS1-RX THIS_IS_MY_TEST Note – The words in the parameter field should be separated with underlines.

name:	FRAME
abstract:	FRAME <address> <parameter>
type:	transmitter command
description:	This command selects the type of framing which will be used by the addressed Transmitter function. The test set uses framing to synchronize transmitted/received data within the data stream, to provide link maintenance capabilities (in some formats), and to provide limited data error checking (in some formats).
address:	The valid AT 9500 addresses for the FRAME command are: DS3-TX (DS3 Transmitter) DS1-TX (DS1 Transmitter) or, optionally 1-TX1 (DS3 Transmitter) 1-TX2 (DS1 Transmitter).
parameters:	The parameter selections for the FRAME command for DS3 data include: OFF — Selects unframed DS3 data transmission. With this selection, every transmitted bit is part of the selected data pattern. There are no framing overhead bits for frame synchronization.

name:	FRAME	
abstract:	FRAME <address> <parameter>	
parameters: (continued)	M13	Selects m13 framing for transmitted output signal. framing is the standard DS3 framing format. When M13 framing is selected, overhead bits are inserted into the transmitted output signal. These overhead bits synchronize: • frame and subframe alignment • maintenance reporting (Xbits) and • error checking (parity).
	CPAR	Selects Cbit Parity framing for transmitted output signal. Cbit Parity framing is a DS3 framing format providing enhanced maintenance features for DS3 transmission. When you select Cbit parity framing, the AT 9500 inserts overhead bits into the transmitted output signal. These overhead bits synchronize: • frame and subframe alignment • maintenance reporting (Xbits and some Cbits), and • error checking (parity, Cbit parity, far end block errors).
example:	FRAME 1-TX1 M13	

The parameters available for the FRAME command for DS1 data include:

OFF – Selects unframed DS1 data transmission. With this selection, every bit that is transmitted is part of the selected data pattern. There are no framing overhead bits for frame synchronization.

SF – Selects the superframe (sf) framing format for the transmitted output signal. When SF framing is selected, overhead bits are inserted into the transmitted output signal, and these overhead bits synchronize frame alignment.

ESF – Selects the extended superframe (esf) framing format for the transmitted output signal. ESF framing is a DS1 framing format which provides enhanced maintenance features for DS1 transmission. When ESF framing is selected, overhead bits are inserted into the transmitted output signal. These overhead bits synchronize:

- frame alignment
- maintenance reporting (4 kbit/sec data link) and
- error checking (crc6).

name:	FRAME
abstract:	FRAME <address> <parameter>
parameters: (continued)	SLC – Selects the Subscriber Loop Carrier (SLC96) framing format for the transmitted output signal. When SLC96 framing is selected, the test set inserts overhead bits into the transmitted output signal. These overhead bits synchronize: • frame alignment • DS0 channel assignment information, and • channel bank maintenance information.
example:	FRAME 1-TX2 SLC

name:	F-SYNC
abstract:	F-SYNC (parameter)
type:	system command
description:	The F-SYNC command controls the framing synchronization mode.
parameters:	The valid parameters for F-SYNC command are: AUTO – causes the addressed receiver to search all possible pattern an frame types to establish frame and pattern lock. The transmitter and receiver can be used independently in AUTO mode. MANUAL – The receivers will only attempt to sync on the frame and pattern types selected for the transmitter and receiver.
example:	F-SYNC MANUAL

name: HELLO

abstract: HELLO (no parameter)

type: system command

description: The Hello command (logon) starts a remote work session in the system (unaddressed) area and generates a directory listing of the functions installed in the AT 9500.

name: HIST-RST

abstract: HIST-RST (no parameters)

type: system command

description: This command (history reset) resets the front panel history LEDs and the history status LEDs that indicate AT 9500 DS3 and DS1 Receiver Status.

name: INPUT

abstract: INPUT <address> <source>

type: receiver command

description: This command allows you to select the source of the DS1 input for the DS1 BERTS Receiver.

address: The address selection for the INPUT command is:
DS1-RX (DS1 Receiver)
or, optionally
2-RX2 (DS1 Receiver).

source: The source selections for the AT 9500 INPUT command are:
EXT - The AT 9500 expects a DS1 input signal from the front panel.
DMUX - The AT 9500 will demultiplex a DS1 from a front panel DS3 input.

example: INPUT DMUX

name: INST-RST

abstract: INST-RST (no parameters)

type: system command

description: This command resets all of the functions in the AT 9500 to the factory default set up parameters.
INST-RST does not affect saved preset panels.

name: LEVEL

abstract: LEVEL <address> <parameter>

type: receiver command, transmitter command

description: This command allows you to select the signal level settings for the DS3 transmitter output signal and the DS3 receiver input network.

address: The address selections for the AT 9500 LEVEL command are:

DS3-TX (DS3 Transmitter)
DS3-RX (DS3 Receiver)

or, optionally

1-TX1 (DS3 Transmitter)
2-RX1 (DS3 Receiver).

parameters: The parameter selections for the LEVEL command are:

HIGH
DSX
LOW
HI-MON (high monitor, -20 dB from high level)
DSX-MON (high monitor, -20 dB from dsx).

example: LEVEL 2-RX1 DSX-LOW

name:	LEVEL-XCON
abstract:	LEVEL-XCON (parameter)
type:	system command
description:	This command overrides the Level setting for the transmitter and receiver. Sets the test set Level to cross-connect (dsx).
parameter:	The parameter for LEVEL-XCON are either OFF or ON.
example:	LEVEL-XCON ON

name:	LLO
abstract:	LLO (no parameter)
type:	system command
description:	The Local Lockout (LLO) command prohibits you from regaining control of the AT 9500 with the front panel LOCAL switch. Use this command to protect the remote users from changes in AT 9500 setup and test operation changes by a local (front panel) user. When LLO is selected, the remote operator should remember to use the LOCAL command to return control of the AT 9500 to local users when the remote session is completed. Note – when power is lost, the AT 9500 will power up under local control.

name:	LOCAL
abstract:	LOCAL (no parameter)
type:	system command
description:	This command returns control of the AT 9500 to the local (front panel) operator.

name: LOCATION

abstract: LOCATION <parameter>

type: system command

description: This command allows you to assign a Location ID to the AT 9500. This ID will be included in all reports and printouts.

parameters: The parameter can be a string of 1–10 characters.

example: LOCATION MADISON_GA

name: LOOPBACK

abstract: LOOPBACK <address> parameter1 parameter2

type: transmitter command

description: This command selects and enables special signaling which will be transmitted by the DS1 transmitter. The loopback UP and DOWN signaling patterns are transmitted for 7 seconds while the UP–UNTIMED and DOWN–UNTIMED signaling patterns are transmitted continuously. When ESF framing is selected, the signaling patterns are transmitted in the 4 kilobit/second data channel. Otherwise, the signaling pattern is transmitted in the output data stream with framing bits overwriting the pattern. The signaling patterns are selected using the LOOPCODE command.

address: The available addresses for the AT 9500 LOOPBACK command include:
  DS1–TX (DS1 Transmitter)
or, optionally
  1–TX2 (DS1 Transmitter).

parameter1: The parameter1 selections for the LOOPBACK command are:
  SF (includes SF and SLC96 framing)
  ESF

parameter2: The second parameter field is to enable the special signaling patterns:
  UP
  DOWN
  UP–UNTIMED
  DOWN–UNTIMED

example: LOOPBACK 1–TX2 ESF UP–UNTIMED

name:	LOOPCODE
abstract:	LOOPCODE <address> parameter1 parameter2 parameter3 parameter4
type:	transmitter command
description:	This command specifies the special signaling which will be transmitted by the DS1 transmitter when the LOOPBACK command is enabled.
address:	The available addresses for the AT 9500 LOOPCODE command include: DS1–TX (DS1 Transmitter) or, optionally 1–TX2 (DS1 Transmitter).
parameter1:	The parameter1 selections for the LOOPCODE command are: SF (includes SF and SLC96 framing) ESF
parameter2:	The second parameter field is to select the special signaling patterns: CSU_LINE NI CSU–PAYLOAD PROG
parameter3:	The third and fourth parameters are only used if parameter2 was PROG. Parameter3 is needed to specify whether the programmable pattern is for the loop up or loop down special signaling: UP DOWN
parameter4:	The fourth parameter specifies the pattern to be transmitted. If ESF was selected, the pattern field can only be 6 bits in length. If SF was selected, the pattern field can only be 8 bits in length.
example:	LOOPCODE 1–TX2 ESF PROG UP 101010

name:	NVR
abstract:	NVR
type:	system command
description:	This command forces the AT 9500 to immediately update the non-volatile state variables for all function.

NOTE

The AT 9500 updates non-volatile state variables every 3 seconds as part of the system operations.

The NVR command is provided for computerized setup routines which can issue many set up commands within a 3 second window, and thus may require an additional level of set up operation security.

name: PATTERN

abstract: PATTERN <address> <parameter1> <parameter2>

type: transmitter command

description: The PATTERN command selects the type of signal pattern which the AT 9500 transmitter will produce.

address: The valid addresses for the PATTERN command are:

- DS3-TX (DS3 Transmitter)
- DS1-TX (DS1 Transmitter)

or, optionally,

- 1-TX1 (DS3 Transmitter)
- 1-TX2 (DS1 Transmitter).

parameter1: The first parameter selection (parameter1) can be one of the following signal patterns:

- PRBS-23
- PRBS-20
- PRBS-15
- PRBS-11
- PRBS-9
- PRBS-6
- 3IN24 (100100100000000000000000)
- 1IN7 (10000000)
- 1111
- 0000
- 1010 BLUE (DS3 only)
- IDLE (DS3 only)
- PROG (programmable).

parameter2: The second parameter (parameter2) is a programmable bit pattern 2 to 24 bits long which can be used with the parameter1 parameter PROG.

example: PATTERN 1-TX1 PROG 1011010001000100101001

name:	PREFERENCE
abstract:	PREF <address> <frame-type>
type:	receiver command
description:	This command defines the frame preference that the DS3 automatic framing algorithm will use when a BLUE or IDLE signal is detected. The PREFERENCE command is necessary because M13 and Cbit Parity framing cannot be distiguished in BLUE and IDLE signals.
address:	The valid address selections for the PREFERENCE command are: DS3-RX (DS3 Receiver) or, optionally, 2-RX1 (DS3 Receiver).
frame-type:	The frame-type commands include: M13 CPAR (C-bit Parity)
example:	PREF 2-RX1 CPAR

name:	PRESETS
abstract:	PRESETS <address>
type:	system command
description:	This command provides a directory of the saved Preset panels for the addressed function.
address:	The address selections for the PRESETS command include: ALL (complete AT 9500 functional setups). EZ-ON (front panel lockout function)
example:	PRESETS EZ-ON

name:	PRINT
abstract:	PRINT <address>
type:	receiver command
description:	This command initiates a forced printout from the addressed receiver to the printer device. The REPORT PRINTER command controls the format of the printout, and the device which is assigned as printer is selected with the PRINT-DEV command.
address:	The address selections for the PRINT command include: DS3-RX (DS3 Receiver) DS1-RX (DS1 Receiver), or, optionally 2-RX1 (DS3 Receiver) 2-RX2 (DS1 Receiver).
example:	PRINT DS1-RX

name:	PRINT-DEV
abstract:	PRINT-DEV <device>
type:	system command
description:	The PRINT-DEV command assigns a device to be the printer. When you select OFF no device is assigned as printer. The default selection is COM2.
device:	The device selections for the PRINT-DEV command include: COM1 serial port COM2 serial port GPIB port OFF
example:	PRINT-DEV COM2

name:	RECALL
abstract:	RECALL <address> <name>
type:	system command
description:	This command restores the set up parameters of the addressed function to those stored for the named preset panel. To examine a list of existing preset panels for a particular address, use the PRESETS command. When an EZ–ON preset panel is recalled, the front panel SET UP keys (except system–preset and demux) are locked out. When the EZ–OFF preset panel is recalled, the setup parameters are not changed, but the lockout feature is disabled. The EZ–OFF preset panel does not require a name.
address:	The address selections for the AT 9500 RECALL command are: ALL (complete AT 9500 functional setup) EZ–ON (front panel lockout function) EZ–OFF.
name:	The name is a 1–8 character string of the available Preset Panels. Use the PRESETS command to find out the names of the available panels.
example:	RECALL DS1–RX PANEL1 (This command string would recall DS1 receiver panel named PANEL1.

name:	REMOTE
abstract:	REMOTE (no parameter)
type:	system command
description:	Use this command to get control of the AT 9500. When the AT 9500 is in remote operation mode, the front panel keys are locked out (except the LOCAL key). The local user can regain control of the AT 9500 by pressing the front panel SHIFT plus LOCAL key.

name:	REMOTE-DEV
abstract:	REMOTE-DEV <parameter>
type:	system command
description:	This command sets the output format for automatic reporting (see REPORT) to the remote device. When you select OFF, there will be no automatic reporting. The default selection is 80 column.
parameters:	The AT 9500 REMOTE-DEV command parameters include: OFF 80 (80 columns) MACH (machine mode) VT52 (also good for VT100 terminal) ANSI (terminal modes) TELE (Televideo terminal).
example:	REMOTE-DEV VT52

name: REPORT

abstract: REPORT <address> <device> <type> <interval time>

type: receiver command

description: This command selects the type of report that the addressed receiver will issue to the selected device (for example, a printer).

address: The valid addresses for the AT 9500 REPORT command include:
DS3–RX (DS3 Receiver)
DS1–RX (DS1 Receiver)
or, optionally
2–RX1 (DS3 Receiver)
2–RX2 (DS1 Receiver).

device: The device field can be either:
PRINTER
REMOTE

type: The valid entries for type are:

OFF – When OFF is selected no events will be reported.

EVENTS – When EVENTS is selected, the following events cause a report:

- When a test starts
- When a status change occurs at the addressed function during a test
- When a test stops.

RESULTS – When RESULTS is selected the following events cause a report:

- test starts
- status change occurs at the addressed function during a test,
- error occurrence is counted at the addressed function during a test
- test stops.

ERRS–PER–SEC – When ERRS–PER–SEC is selected the following events cause a report:

- test start
- status change occurs at the addressed function during a test
- error occurrence is counted at the addressed function during a test
- test stops.

The error events are reported with a special single line format (#errors per second, gated ber over the second). If more than one selected error type is detected during a second, the highest priority error type will be printed. The reporting priority for DS3 is bit, fbit, parity, cbit parity, febe, bpv. The reporting priority for DS1 is bit, fbit, crc6, bpv.

REFRESH – When REFRESH is selected, the all/part results report will be generated periodically, with the time period based on the specified interval (see SET–RESULTS for all/part specification and REMOTE–DEV for remote device format specification).

interval time: The interval time field for the REPORT command is:

xx:yy:zz (time interval for refresh operation)
xx = hours
yy = minutes
zz = seconds.

example: REPORT DS3–RX PRINTER EVENTS

name: RERUN

abstract: RERUN (no parameters)

type: system command

description: This command resets error counters and status fields, and restarts the test in progress.

name: RESULTS

abstract: RESULTS <address> <parameter>

type: receiver command

description: This command provides a requests test totals data of the addressed function. When you request partial results, the information that is provided is defined with the SET-RESULTS command.

address: The valid addresses for the AT 9500 RESULTS command include:

- DS3-RX (DS3 Receiver)
- DS1-RX (DS1 Receiver)
- DS3-SA (DS3 Signal Analysis Option)
- DS1-SA (DS1 Signal Analysis Option)

or, optionally

- 2-RX1 (DS3 Receiver)
- 2-RX2 (DS1 Receiver)
- 3-SA1 (DS3 Signal Analysis Option)
- 3-SA2 (DS1 Signal Analysis Option).

parameters: The parameters field entries are:

- ALL
- PART

See the Sample Printouts – Report Results in Chapter 4 How to Use the Printer.

example: RESULTS 2-RX1 ALL

name: RUN

abstract: RUN <no parameters>

type: system command

description: This command clears the AT 9500 error counters and status fields and starts a test. You can specify the type of test that will run with the TEST-TYPE command.

name:	SAVE
abstract:	SAVE <address> <name>
type:	system command
description:	This command saves the current set up of the addressed function in the named preset panel. To examine a list of existing preset panels for a particular address, use the PRESETS command.
address:	The valid addresses for the AT 9500 SAVE command include: ALL (complete AT 9500 functional setup) EZ–ON (front panel lockout function).
name:	The name field can be a 1–8 character string.
example:	SAVE ALL TEST1

name: SET-DISPLAY

abstract: SET-DISPLAY <address> <list>

type: receiver command

description: The AT 9500 uses this command to determine which of the test type results (error types and categories) of the specified addressed function are available for display on the front panel.

address: The valid addresses for the SET-DISPLAY command are for the test set receivers and include:

DS3-RX (DS3 Receiver)
DS1-RX (DS1 Receiver),

or, optionally

2-RX1 (DS3 Receiver)
2-RX2 (DS1 Receiver).

list: In the list field you can enter any of the following:

ALL
BPV
CRC6 (DS1 only)
CBIT-P (DS3 only)
BIT
FBIT
PARITY (DS3 only)
FEBE (DS3 only)
ERRS (total errors, average error rate, error seconds)
THRES (threshold error seconds)
PERCT (% error free seconds, % error seconds, consecutive severely error seconds (cses)).

example: SET-DISPLAY DS3-RX FBIT PARITY CBIT-P PERCT

name: SET-RESULTS

abstract: SET-RESULTS <address> <list>

type: receiver command

description: The AT 9500 uses this command to determine which results (error types and categories) of the specified addressed function are available for a results request and automatic reporting. For more information on the results request, see the RESULTS command, and for more information on automatic reporting, see REPORT command.

address: The valid addresses for the SET-DISPLAY command are for the two AT 9500 receivers and include:

DS3-RX (DS3 Receiver)
DS1-RX (DS1 Receiver),

or, optionally
- 2-RX1 (DS3 Receiver)
- 2-RX2 (DS1 Receiver).

list: In the list field you can enter any of the following:
- ALL
- BPV
- CRC6 (DS1 only)
- CBIT-P (DS3 only)
- BIT
- FBIT
- PARITY (DS3 only)
- FEBE (DS3 only)
- STATUS ERRS (total errors, average error rate, error seconds)
- THRES (threshold error seconds)
- PERCT (% error free seconds, % error seconds, consecutive severely error seconds (cses)).

example: SET-RESULTS 2-RX2 ALL

name: SETUP

abstract: SETUP <address>

type: receiver command

description: This command provides an inquiry of the addressed function for current set up parameters. To examine the setup parameters for the AT 9500 system function, use the SYS command.

parameters: The available addresses for the AT 9500 SETUP command include:
- DS3-TX (DS3 Transmitter)
- DS3-RX (DS3 Receiver)
- DS3-SA (DS3 Signal Analysis Option)
- DS1-TX (DS1 Transmitter)
- DS1-RX (DS1 Receiver)
- DS1-SA (DS1 Signal Analysis Option)

or, optionally
- 1-TX1 (DS3 Transmitter)
- 2-RX1 (DS3 Receiver)
- 3-SA1 (DS3 Signal Analysis Option)
- 1-TX2 (DS1 Transmitter)
- 2-RX2 (DS1 Receiver)
- 3-SA2 (DS1 Signal Analysis Option).

example: SETUP DS1-TX

The following four figures show sample printed outputs provided in response to the SETUP command from a remote terminal.

```
REMOTE>SETUP DS1-RX


        Channel : DS1-RX

 DS1 Dmux chnl# : 01
         Coding : AMI
          Input : EXT

  Report Remote : OFF
 Report Printer : OFF
    Facility ID : DS1_Error_Rate_Test

 Results Format : PART  ERRS PERCT STATUS THRESH  BIT BPV CRC6 FBIT

 Display Format : PART  ERRS PERCT THRESH  BIT BPV CRC6 FBIT

 BIT Thresholds : 000001 (6.52E-7)   000002 (1.30E-6)   001536 (1.00E-3)
FBIT Thresholds : 000001 (6.52E-7)   000002 (1.30E-6)   000004 (2.61E-6)
CRC6 Thresholds : 000001 (6.52E-7)   000002 (1.30E-6)   000154 (1.00E-4)

         Errors : OFF
```

Sample Output – Remote Command Response, SETUP (DS1 Receiver)

```
REMOTE (DS1-RX)>SETUP DS3-TX


             Channel : DS3-TX

               Level : DSX
               Frame : M13
             Pattern : PRBS-15
               Clock : INTERNAL
             Tx-Busy : OFF
                Xbit : 1

              Errors : Pattern: BIT    Frame: FBIT    Coding: BPV
```

Sample Output – Remote Command Response, SETUP (DS3 Transmitter)

```
REMOTE (DS3-TX)>SETUP DS1-TX


             Channel : DS1-TX
                Code : AMI
               Frame : SF
             Pattern : PRBS-20

      Loopback (esf) : OFF
      Loopcode (esf) : CSU-LINE
      Loopback (sf)  : OFF
      Loopcode (sf)  : CSU-LINE

              Yellow : OFF
               Clock : INTERNAL
             Tx-Busy : OFF

              Errors : Pattern: BIT    Frame: FBIT    Coding: BPV
```

Sample Output – Remote Command Response, SETUP (DS1 Transmitter)

```
REMOTE (DS1-TX)>SETUP DS3-RX


        Channel : DS3-RX

 DS3 Dmux chnl# : 01
          Level : DSX
     Preference : M13

  Report Remote : OFF
 Report Printer : OFF
    Facility ID : DS3_Error_Rate_Test

 Results Format : PART  ERRS PERCT STATUS THRESH  BIT BPV CBIT FBIT FEBE PARITY

 Display Format : PART  ERRS PERCT THRESH  BIT BPV CBIT FBIT FEBE PARITY

 BIT Thresholds : 000001 (2.26E-8)   000002 (4.52E-8)   000045 (1.02E-6)
FBIT Thresholds : 000001 (2.26E-8)   000002 (4.52E-8)   000045 (1.02E-6)
 PAR Thresholds : 000001 (2.26E-8)   000002 (4.52E-8)   000045 (1.02E-6)

         Errors : OFF
```

Sample Output – Remote Command Response, SETUP (DS3 Receiver)

name: SQUELCH

abstract: SQUELCH <parameter>

type: system command

description: This command causes the AT 9500 to inhibit error event reporting on the printer after 10 consecutive seconds of report events. The inhibit is disabled when 10 consecutive seconds occur in which no printout is attempted (ten consecutive non-event/error free seconds).

parameters: The SQUELCH command parameter field may be either ON or OFF.

name: STATUS

abstract: STATUS <address>

type: receiver command

description: The STATUS command inquires the addressed function about alarm and status information.

address: The valid AT 9500 address parameters for the STATUS command are:
DS3-RX (DS3 Receiver)
DS1-RX (DS1 Receiver)
or, optionally
2-RX1 (DS3 Receiver) 2-RX2 (DS1 Receiver).

example: STATUS 2-RX2 (What is the status of the DS1 receiver?)

The following figures show sample printed outputs provided in response to the STATUS command from a remote controller.

name: STOP

abstract: STOP (no parameters)

type: receiver command

description: This command stops the test in progress.

```
REMOTE (DS3-RX)>STATUS DS3-RX

                           DS3 Error Rate Test           ALARMS  CLEAR
----------------------------------------------------------------------------
15:55:17 06/09  SA AT 9500 ATLANTA GA   Slot 2 RX1 DS3       Mode:  M13  DSX
END OF TEST STATUS                      Timer: 00:00:05      Pattern: PRBS15
----------------------------------------------------------------------------
STATUS      Current  Seconds  #Occur               Current  Seconds  #Occur
  Frame Loss...  no      0        0    Pattern Loss...  no      0        0
 Signal Loss...  no      0        0    Excess Zeros...  no      0        0
  Blue (AIS)...  no      0        0     Idle (1010)...  no      0        0
  Power Loss...  no      0        0      Xbit Alarm...  no      0        0
DS2 Frame Ls... yes      5        1    DS2 Xbit Alm...  no      0        0
```

Sample Output – Remote Command Response, STATUS (DS3 Receiver)

```
REMOTE (DS3-RX)>STATUS DS1-RX

                           DS1 Error Rate Test           ALARMS  CLEAR
----------------------------------------------------------------------------
15:55:17 06/09  SA AT 9500 ATLANTA GA   Slot 2 RX2 DS1       Mode:   SF  AMI
END OF TEST STATUS                      Timer: 00:00:05      Pattern: PRBS20
----------------------------------------------------------------------------
STATUS      Current  Seconds  #Occur               Current  Seconds  #Occur
  Frame Loss...  no      0        0    Pattern Loss...  no      0        0
 Signal Loss...  no      0        0    Excess Zeros...  no      0        0
Yellow Alarm...  no      0        0        All Ones...  no      0        0
  Power Loss...  no      0        0    Data Channel... n/a
```

Sample Output – Remote Command Response, STATUS (DS1 Receiver)

name:	SUMMARY
abstract:	SUMMARY <address>
type:	receiver command
description:	The SUMMARY command requests test summary information from the AT 9500 addressed function. The requested information will include the total error second counts for each of the function's error types.
address:	The available addresses for the AT 9500 SUMMARY command are: DS3–RX (DS3 Receiver) DS1–RX (DS1 Receiver) or, optionally 2–RX1 (DS3 Receiver) 2–RX2 (DS1 Receiver).

The following two figures show sample printed outputs provided in response to the SUMMARY command from a remote controller.

```
REMOTE (DS1-RX)>SUMMARY DS3-RX

                           DS3 Error Rate Test           ALARMS  CLEAR
----------------------------------------------------------------------------
15:57:22 06/09  SA AT 9500 ATLANTA GA   Slot 2 RX1 DS3       Mode:  M13  DSX
END OF TEST SUMMARY                     Timer: 00:01:08      Pattern: PRBS15
----------------------------------------------------------------------------
 ERROR         Totals   Seconds                          Totals   Seconds
      Bit..........1          1                Fbit..........1          1
   Parity..........1          1                 BPV..........1          1
   Cbit/p..........0          0                FEBE........n/a        n/a
```

Sample Output – Remote Command Response, SUMMARY (DS3 Receiver)

```
REMOTE (DS3-TX)>SUMMARY DS1-RX

                          DS1 Error Rate Test          ALARMS  CLEAR
---------------------------------------------------------------------------
15:57:22 06/09  SA AT 9500 ATLANTA GA   Slot 2 RX2 DS1      Mode:   SF  AMI
END OF TEST SUMMARY                     Timer: 00:01:08     Pattern: PRBS20
---------------------------------------------------------------------------
 ERROR         Totals   Seconds                         Totals   Seconds
      Bit........138       38              CRC6........n/a         n/a
     Fbit..........1        1               BPV........138          38
```

Sample Output – Remote Command Response, SUMMARY (DS1 Receiver)

name:	SYS
abstract:	SYS (no parameter)
type:	system command
description:	This command requests current system (system function) set up parameters of the AT 9500. To examine the other set up parameters in the AT 9500, use the SETUP command. The following figure shows a sample printed output provided in response to the SYS command from a remote terminal.

```
REMOTE (DS1-RX)>SYS


           Test-Type : UNTIMED
               Timer : 000:01:00
          Test State : STOP

        Print Device : COM2
       Remote Device : 80
           Baud-COM1 : 9600
            HHS-COM1 : OFF
           Baud-COM2 : 9600
            HHS-COM2 : ON
                Echo : ON
             Squelch : ON
            Timeline : OFF
         Location ID : ATLANTA_GA

             Err-Sec : ASYNC
            Err-Beep : OFF
Zero Suppr - PRBS20 : 15
     Frame Sync Mode : AUTO
          Level-XCon : OFF
       Local Lockout : OFF
      Operation Mode : Comprehensive Mode
```

Sample Output – Remote Command Response, SYS

name:	TEST–TYPE
abstract:	TEST–TYPE <parameter>
type:	system command
description:	This command defines the type of test that will be executed by the AT 9500 when a RUN command is received. When selecting a timed test (single or repeat) use the TIMER command to set the duration of the test.
parameters:	The available parameters for the TEST–TYPE command are: UNTIMED SINGLE REPEAT
example:	TEST–TYPE REPEAT

name:	THRESHOLDS
abstract:	THRES–<type> <address> <a, b, c>
type:	receiver command
description:	This command sets the error thresholds of the addressed function for the defined error type. The three classes the AT 9500 separates errors into are: dribbling bursty and severely. In addition, the AT 9500 error thresholds can be set for the following: bits fbits parity (DS3 only) or crc6 (DS1–ESF). The DS3 parity thresholds also apply to cbit/p and febe errors (DS3–CPAR). The AT 9500 uses the threshold values to classify the errors measured by the test set as dribbling, bursty, or severely errored seconds. The test set will increment only one of the threshold error counters per second. The thresholds are: a = dribbling, b = bursty , c = severely, where a < b < c.

type: The threshold error types the AT 9500 can detect include:

- BIT (both BIT, BPV)
- FBIT
- PAR (parity, cbit/p, febe, DS3 only)
- CRC6 (DS1 only).

address: The valid addresses for the THRESHOLD command include both AT 9500 receivers:

- DS3-RX (DS3 Receiver)
- DS1-RX (DS1 Receiver)

or, optionally

- 2-RX1 (DS3 Receiver)
- 2-RX2 (DS1 Receiver).

a, b, c The a,b,c entries are the # of errors in a second (integer) or rate (v.xyE-z).

example: THRES-FBIT DS3-RX 1.00E-9, 1.00E-6, 1.00E-3 (Set the DS3 FBIT error threshold to 1.00E-9 (dribbling), 1.00E-6 (bursty) and 1.00E-3 for severely errored second counters.

name: THRU

abstract: THRU <address> <parameter>

type: receiver command

description: Use this command to set up the operating mode of the thru data output for the addressed receiver.

address: The available addresses for the THRU command are:

- DS3-RX (DS3 Receiver)
- DS1-RX (DS1 Receiver)

or, optionally

- 2-RX1 (DS3 Receiver)
- 2-RX2 (DS1 Receiver).

parameter: The parameter selections for the AT 9500 THRU command are:

- RE-ENCODE (default setting) - In re-encode mode, the thru data output is re-encoded, but is not reframed. Error insertion on the thru data output signal is restricted to coding-type errors (bpv, combo, code)and Burst errors. For DS1 data, the thru data output coding can be selected using the CODE command.

parameters: (conc.)

RE-FRAME – In re-frame mode, the AT 9500 thru data output is re-encoded and reframed (framing and parity/crc6 errors are corrected). Error insertion on the thru data output signal is restricted to coding and some frame type errors (bpv, combo, code, fbit, parity crc6), Burst errors, and 1/SF errors. For DS1 data, the thru data output coding can be selected using the CODE command.

example: THRU 2-RX1 RE-FRAME

name: TIME

abstract: TIME <hour:minute:second>

type: system command

description: The TIME command sets the time of day for the AT 9500.

hour:minute: hour = 01,..,24 minute and second = 01,..,59 second:

example: 03:10:05

name:	TIMELINE
abstract:	TIMELINE <parameter>
type:	system command
description:	The TIMELINE command enables the AT 9500 to transmit a confidence timeline report to the print device every half hour. The confidence timeline report demonstrates that the AT 9500 and the printer are operational when no errors are being reported.
parameters:	The parameters for TIMELINE are either: ON or OFF

name:	TIMER
abstract:	TIMER <hour:minute:second>
type:	system command
description:	The TIMER command sets the timer duration for timed tests (single, repeat). To execute a timed test, use the RUN command. To specify a timed test, use the TEST–TYPE command.
hour:minute:	hour = 01,..,999 minute and second = 01,..,59 second:
example:	003:10:05

name:	TX-BUSY
abstract:	TX-BUSY <address> <parameter>
type:	transmitter command
description:	The TX-BUSY command sets the addressed transmitter to the busy state. When a transmitter is busy it will be indicated in the directory, and all set up commands to that transmitter function will be rejected (except TX-BUSY OFF).
address:	The address selections for the AT 9500 TX-BUSY command are: DS3-TX (DS3 Transmitter) DS1-TX (DS1 Transmitter) or, optionally 1-TX1 (DS3 Transmitter) 1-TX2 (DS1 Transmitter).
parameter:	The TX-BUSY command can be either ON or OFF.

name:	YELLOW
abstract:	YELLOW <address> parameter1
type:	transmitter command
description:	This command enables/disables the special yellow alarm signaling which will be transmitted by the DS1 transmitter.
address:	The address addresses for the AT 9500 YELLOW command are: DS1-TX (DS1 Transmitter) or, optionally 1-TX2 (DS1 Transmitter).
parameter:	The parameter1 selections for for the YELLOW command are: ON OFF
example:	YELLOW 1-TX2 ON

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name: XBIT

abstract: XBIT <address> <parameter>

type: transmitter command

description: This command selects the X-bit value for the DS3 transmitter output. The X-bit selection is only valid for framed DS3 transmission.

address: The XBIT address selection for the AT 9500 is:
DS3-TX (DS3 Transmitter)
or, optionally
1-TX1 (DS3 Transmitter).

parameter: The parameter field can be either 0 or 1 where:
0 sets the X-bit to a logic 0
1 sets the X-bit to a logic high

name: ZERO-PRBS20

abstract: ZERO-PRBS20 <parameter>

type: system command

description: This command selects the type of zero suppression that will be used by the DS1 functions on the PRBS20 pattern.

parameter: The parameters for ZERO-PRBS20 are:
0: No zero suppression
14: Performs 14 zero suppression (substitutes a data 1 for the fourteen consecutive zero in the PRBS20 pattern)
15: Same; 15 instead of 14

example: ZERO-P-15

name:	?
abstract:	? <address>
type:	transmitter command, receiver command, system command
description:	This command provides a list of the valid commands for the addressed function. With the valid command are the parameter tokens for the addressed function.

address: The available addresses for the AT 9500 are:

DS3-RX (DS3 Receiver)
DS1-RX (DS1 Receiver)
DS3-TX (DS3 Transmitter)
DS1-TX (DS1 Transmitter)
DS3-SA (DS3 Signal Analysis Option)
DS1-SA (DS1 Signal Analysis Option)

or, optionally

2-RX1 (DS3 Receiver)
2-RX2 (DS1 Receiver)
1-TX1 (DS3 Transmitter)
1-TX2 (DS1 Transmitter)
3-SA1 (DS3 Signal Analysis Option)
3-SA2 (DS1 Signal Analysis Option).

If no address is included, ? provides a list of valid system commands

example: ? DS3-RX

The following figures show sample printed outputs provided in response to the ? command from a remote terminal.

```
REMOTE>?

  ?
  ADDR
  BYE
  CMD-ERROR
  DATE
  DCL
  DELETE
  DIR
  ECHO
    OFF ON
  ERR-BEEP
    OFF ON
  ERR-SEC
    SYNC ASYNC EVENT RTC
  F-SYNC
    AUTO MANUAL
  HELLO
  HELP
  HI
  HIST-RST
  INST-RST
  LEVEL-XCON
    OFF ON
  LOCAL
  LLO
    OFF ON
  LOCATION
  NVR
  PRESETS
  PRINT-DEV
    COM1 COM2 GPIB OFF
  RECALL
  REMOTE
  REMOTE-DEV
    OFF 80 MACHINE VT52 ANSI TELEVIDEO
  RERUN
  RUN
  SAVE
  SQUELCH
    OFF ON
  STOP
  SYSTEM
  TEST-TYPE
    * REPEAT SINGLE UNTIMED
  TIME
  TIMELINE
    OFF ON
  TIMER
  ZERO-PRBS20
    0 14 15

Note: type "? <addr>" for command list of addressed channel
      type "dir" or "hi" for list of channel addresses
      type "<ctrl> r" to repeat the last command
      type "<ctrl> z" to terminate all automatic reporting
```

Sample Output – Remote Command Response, ?

```
REMOTE>? DS1-TX

  ?
  CLOCK
    INTERNAL LOOP EXTERNAL
  CODE
    AMI B8ZS
  ERRORS
    1-SF
    BER
    BURST
      10MS 100MS FRAME SF
    BIT
    BPV
    CBIT
    CODE
    COMBO
    CRC6
    FBIT
    FEBE
    OFF
    PARITY
  FRAME
    CPAR ESF M13 OFF SF SLC
  HELP
  LEVEL
    DSX DSX-MON HI-MON HIGH LOW
  LOOPBACK
    SF
      OFF UP DOWN UP-UNTIMED DOWN-UNTIMED
    ESF
      OFF UP DOWN UP-UNTIMED DOWN-UNTIMED
  LOOPCODE
    SF
      CSU-LINE
      NI
      CSU-PAYLOAD
      PROG
        UP DOWN
    ESF
      CSU-LINE
      NI
      CSU-PAYLOAD
      PROG
        UP DOWN
  PATTERN
    0000 1-7 1010 1111 3IN24 BLUE IDLE PRBS-6 PRBS-9 PRBS-11 PRBS-15 PRBS-20 PRBS-23 PROG
  SETUP
  TX-BUSY
    OFF ON
  XBIT
    0 1
  YELLOW
    ON OFF

Note: type "?" for system command list
      type "dir" or "hi" for list of channel addresses
      type "<ctrl> r" to repeat the last command
      type "<ctrl> z" to terminate all automatic reporting
```

Sample Output – Remote Command Response, ?

```
REMOTE (DS1-TX)>? DS1-RX

  ?
  ALARMS-RST
  CODE
    AMI B8ZS
  DMUX
  ERRORS
    1-SF
    BER
    BPV
    BURST
      10MS 100MS FRAME SF
    CODE
    COMBO
    CRC6
    FBIT
    OFF
    PARITY
  FACILITY
  HELP
  INPUT
    DMUX EXT
  LEVEL
    DSX DSX-MON HI-MON HIGH LOW
  PREFERENCE
    CPAR M13
  PRINT
  REPORT
    PRINTER
      OFF ERRS-PER-SEC EVENTS RESULTS
    REMOTE
      ERRS-PER-SEC EVENTS OFF REFRESH RESULTS
  RESULTS
    ALL PART
  SET-DISPLAY
    ALL BIT BPV CBIT CRC6 ERRS FBIT FEBE PART PARITY PERCT THRESH
  SET-RESULTS
    ALL BIT BPV CBIT CRC6 ERRS FBIT FEBE PARITY PART PERCT STATUS THRESH
  SETUP
  STATUS
  SUMMARY
  THRES-BIT
  THRES-CRC6
  THRES-FBIT
  THRES-PAR
  THRU
    RE-ENCODE RE-FRAME

Note: type "?" for system command list
      type "dir" or "hi" for list of channel addresses
      type "<ctrl> r" to repeat the last command
      type "<ctrl> z" to terminate all automatic reporting
```

Sample Output – Remote Command Response, ?

```
REMOTE (DS1-RX)>? DS3-TX

 ?
 CLOCK
  INTERNAL LOOP EXTERNAL
 CODE
  AMI B8ZS
 ERRORS
  1-SF
  BER
  BURST
   10MS 100MS FRAME SF
  BIT
  BPV
  CBIT
  CODE
  COMBO
  CRC6
  FBIT
  FEBE
  OFF
  PARITY
 FRAME
  CPAR ESF M13 OFF SF SLC
 HELP
 LEVEL
  DSX DSX-MON HI-MON HIGH LOW
 LOOPBACK
  SF
   OFF UP DOWN UP-UNTIMED DOWN-UNTIMED
  ESF
   OFF UP DOWN UP-UNTIMED DOWN-UNTIMED
 LOOPCODE
  SF
   CSU-LINE
   NI
   CSU-PAYLOAD
   PROG
    UP DOWN
  ESF
   CSU-LINE
   NI
   CSU-PAYLOAD
   PROG
    UP DOWN
 PATTERN
  0000 1-7 1010 1111 3IN24 BLUE IDLE PRBS-6 PRBS-9 PRBS-11 PRBS-15 PRBS-20 PRBS-23 PROG
 SETUP
 TX-BUSY
  OFF ON
 XBIT
  0 1
 YELLOW
  ON OFF

Note: type "?" for system command list
      type "dir" or "hi" for list of channel addresses
      type "<ctrl> r" to repeat the last command
      type "<ctrl> z" to terminate all automatic reporting
```

Sample Output – Remote Command Response, ?

```
REMOTE (DS3-TX)>? DS3-RX

  ?
  ALARMS-RST
  CODE
    AMI B8ZS
  DMUX
  ERRORS
    1-SF
    BER
    BPV
    BURST
      10MS 100MS FRAME SF
    CODE
    COMBO
    CRC6
    FBIT
    OFF
    PARITY
  FACILITY
  HELP
  INPUT
    DMUX EXT
  LEVEL
    DSX DSX-MON HI-MON HIGH LOW
  PREFERENCE
    CPAR M13
  PRINT
  REPORT
    PRINTER
      OFF ERRS-PER-SEC EVENTS RESULTS
    REMOTE
      ERRS-PER-SEC EVENTS OFF REFRESH RESULTS
  RESULTS
    ALL PART
  SET-DISPLAY
    ALL BIT BPV CBIT CRC6 ERRS FBIT FEBE PART PARITY PERCT THRESH
  SET-RESULTS
    ALL BIT BPV CBIT CRC6 ERRS FBIT FEBE PARITY PART PERCT STATUS THRESH
  SETUP
  STATUS
  SUMMARY
  THRES-BIT
  THRES-CRC6
  THRES-FBIT
  THRES-PAR
  THRU
    RE-ENCODE RE-FRAME

 Note: type "?" for system command list
       type "dir" or "hi" for list of channel addresses
       type "<ctrl> r" to repeat the last command
       type "<ctrl> z" to terminate all automatic reporting
```

Sample Output – Remote Command Response, ?

name:	ctrl r
abstract:	ctrl r
type:	system command
description:	Repeats the last valid command.

name:	ctrl Z
abstract:	ctrl Z
type:	system command
description:	Executes a REMOTE-DEV OFF command. Use this command to stop autologging or printouts to the remote terminal so subsequent commands can be entered.

APPENDIX A
TECHNICAL SPECIFICATIONS

This appendix presents the technical specifications for the Model AT9500 Digital Transmission Analyzer. These specifications detail the basic operating characteristics of the test set, and are helpful in determining the suitability of the AT 9500 for various testing applications.

Characteristic	Specification
DS3 RECEIVE	
Input	Bipolar
Encoding	B3ZS
Automatic Framing Detect	Standard M13, C–bit parity or no framing
Automatic Pattern Detect	Live traffic, PRBS 2 X 10(^{6,9,11,15,20,23})–1 repeating 1– 24 bit pattern, BLUE, idle
Level Select	High and DSX/LO per CB119 and similar specifications
Jitter Tolerance	Input jitter accommodation requirements per Bellcore TR–TSY–000009 and similar specifications
Dynamic Range	Typically 25 dB below a DSX level signal
Return Loss	>20 dB, 23 dB typical
Connector	Accepts a WECO 440 type
Impedance	75 ohms

Characteristic	Specification
DS3 MEASUREMENTS	
Frame Type:	Error Types:
M13	Bit, BPV, parity, F-bit, C-bit
C-BIT Parity	Bit, BPV, C-bit parity, parity, FEBE, F-bit
Unframed	Bit, BPV
Measurements Categories:	Range:
Total Errors	1.00×10^{16}
Error Rate (BER)	1.00×10^{16}
Error Seconds (ES)	2.00×10^{9}
%Error Seconds (%ES)	100.00%
%Error Free Seconds (%EFS)	100.00%
Dribbling Error Second (DES)	Programmable, ≥ 1
Bursty Error Second (BES)	Programmable, >DES
Severely Error Second (SES)	Programmable, >BES
Continuously Severely Error Second (CSES)	Based on 3 or more continuous SES
DS3 STATUS INDICATIONS	
Front Panel LEDs (Current and History)	OOF, LOS, LOP, BLUE
Occurrences/Status Seconds	OOF, LOS, LOP, BLUE, idle, excess zeros
Other Status Seconds	X-bit, Power Loss
DS3 Present Status:	
Signal	Signal loss, framing, level
Pattern	PRBS, fixed repeating, BLUE, idle, all ones, live, all zeros
Excess Zeros	Yes or No

Characteristic	Specification
DS2 STATUS	
No. of Occurrences	Out of frame
Error Seconds	Out of frame, X–bit, all ones
DS3 TRANSMIT OUTPUTS	
Outputs	3 Bipolar
Encoding	B3ZS
Framing Format	Standard M13, C–bit parity or no framing
Waveshape Select	High, high monitor, DSX, DSX monitor and LO per CB–119 and T1X1 standards
Connector	Accepts WECO 440–type
Impedance	75 ohms
Frequency	44.736 MHz
Stability	±20 ppm, 0 to 20 years, 0° to 50° C
Return Loss	>20 dB, 23 dB typical
External Clock Input:	
Connector	BNC
Impedance	75 ohms
Frequency Range	>±1%
Clock Select	External, or loop–timed
Patterns:	
PRBS	$2 \text{ X } 10(^{6},^{9},^{11},^{15},^{20},^{23})-1$
Programmable	1–24 bits repeating pattern
Fixed	All ones, 3 in 24, 1:7, all zeros, 1010, BLUE, idle
Error Insert:	
Single	Bit, F–bit, parity, C–parity, BPV, FEBE, code, combo
Rate	Bit, F–bit, parity, C–parity, BPV, FEBE, code, combo

Characteristic	Specification
Burst	Turns the transmitter off for frame, SF, 10ms, or 100 ms
1/SF	1 Payload error per superframe
X-bit select	Alarm or Non-alarm
DS3 THRU MODE OUTPUT	
Output	1 Bipolar
Encoding	B3ZS
Connector	Accepts WECO 440 type
Level	DSX regenerated
DS3 THRU MODE ERROR INSERT	
Single	F-bit, BPV, parity, code, combo
Rate	F-bit, parity, BPV, code, combo
Burst	Turn transmitter off for frame, SF, 10ms, or 100 ms
1/SF	1 Payload error per superframe
DS1 RECEIVE	
Input	Bipolar
Encoding	AMI or B8ZS
Automatic Framing Detect	SF (same as D4), ESF, SLC-96, no framing
Automatic Pattern Detect	Live traffic, PRBS 2 X 10$^{(6,9,11,15,20,23)}$-1 repeating 1- 24 bit pattern, YELLOW, all ones, all zeros
ESF 4 kB/sec Data Channel Display	16-bit pattern
Input Level	DSX Monitor
Connector	Accepts a WECO 310 type
Impedance	100 ohms

Characteristic	Specification
Jitter Tolerance	Input jitter tolerance accommodation requirements per Bellcore TR–TSY–000009 and similar specifications
Dynamic Range	26 dB below DSX
Return Loss	>26 dB, 30 dB typical
DS1 MEASUREMENTS	
Frame Type:	Error Types:
ESF	Bit, BPV*, CRC–6, F–bit
SF/SLC–96	Bit, BPV*, F–bit
Unframed	Bit, BPV*
Measurement Categories:	Range:
Total Errors	1.00×10^{15}
Error Rate (BER)	1.00×10^{16}
Error Seconds (ES)	2.00×10^{9}
%Error Seconds (%ES)	100.00%
%Error Free Seconds (%EFS)	100.00%
Dribbling Error Second (DES)	Programmable, ≥ 1
Bursty Error Second (BES)	Programmable, >DES
Severely Error Second (SES)	Programmable, >BES
Continuously Severely Error Second (CSES)	Based on 3 or more continuous SES
DS1 STATUS INDICATIONS	
Front Panel LEDs (Current and History)	Signal loss, frame loss, pattern loss, all ones
DS1 Occurrences/Status Seconds	Signal loss, frame loss, all ones, pattern loss, excess zeros, YELLOW alarm

*External DS1 Signal Only

Characteristic	Specification
DS1 PRESENT SIGNAL STATUS	
Signal	Signal loss, framing, line code
Pattern	PRBS, fixed repeating, YELLOW, all ones, all zeros, live
Excess Zeros	Yes or No
DS1 Source	External or demux channel number
Signaling	ESF 4 kB/sec data channel
DS1 TRANSMIT OUTPUT	
Output	1 Bipolar
Encoding	AMI or B8ZS
Framing Format	SF (same as D4), ESF, SLC–96, no framing
Waveshape	DSX
Connector	Accepts WECO 310 type
Impedance	100 ohms
Frequency	1.544 MHz
Stability	±15 ppm, 0° to 50° C
Return Loss	>26 dB, 30 dB typical
External Clock Input:	
Connector	BNC
Impedance	75 ohms
Frequency Range	>±1%
Clock Select	External, or loop–timed
Patterns:	
PRBS	2 X 10(^{6,9,11,15,20,23})–1 14, 15, or no zero suppression for 2 X 10^{20}–1
Programmable	1–24 bit repeating pattern
Fixed	All ones, 3 in 24, 1:7, all zeros, 1010

Characteristic	Specification
Loopbacks	CSU, Network Interface, and programmable loopup/loopdown codes
Yellow Alarm	ON/OFF
Error Insert:	
Single	Bit, F-bit, CRC-6, BPV, combo, code
Rate	Bit, F-bit, CRC-6, BPV, combo, code
Burst	Turns transmitter off for frame, SF, 10ms, or 100 ms
1/SF	1 Payload error per superframe
DS1 THRU/DEMUX OUTPUT	
Output	Bipolar only for either THRU/Demux
Output Channel Select	1-28 DS1 from a DS3 input, or external input
Output Encoding Select	AMI, B8ZS
Output Level	DSX only
Error Insert:	THRU mode only
Single	F-bit, CRC-6, BPV, code, combo
Rate	F-bit, CRC-6, BPV, code, combo
Burst	Turns the transmitter off for frame, SF, 10 ms, or 100 ms
1/SF	1 Payload error per superframe
DS0/VF OUTPUT	
DS0/VF Channel Selection	Select channel 1-24 from internal or external DS1
DS0 Output	Separate 64 kb/sec data, 64 kHz clock (TTL levels)
Connector	9-pin D-type, digital TTL signal

Characteristic	Specification
Voice Frequency (VF)	600 ohm balanced, WECO 310 and internal speaker
Additional Status Indications:	
Remote	LED indicates remote control of AT 9500
Power Loss	LED indicates power loss during test
REMOTE INTERFACES	
	(1) One 25-pin type DTE RS-232 with control lines
	(2) One 9-pin D-type DCE RS-232 with control lines
	(3) IEEE-488 GPIB
POWER	
AC	115V ac, 50-60 Hz ±10% 230V ac
DC	Optional, -24V dc and -48V dc
	AC convenience outlet for printer
GENERAL	
Speaker	0-4000 Hz with volume control
Sonalert	For operator software errors
Display	240 x 64 LCD Graphics; backlit with contrast control knob
Size	7" x 14" x 12" (approximately)
Weight	15 lbs (approximately)

APPENDIX B
GLOSSARY

This chapter contains definitions of words and terms commonly used and referred to in this manual.

All Ones (A1S) – An all 1's signal (usually) output by in–line equipment to indicate to down line devices that its input failed. Pulse density is 99%, or greater. An all 1's signal is recognized with or without framing.

Alternate Mark Inversion (AMI) – A coding scheme where successive data 1's are transmitted as alternate, equal positive and negative pulses, and data 0's are sent as a space of zero amplitude.

Automatic Reporting Function (REPORT) – The following conditions may cause unsolicited printouts from the test set:

1. OFF: The AT9500 will not report to the printer during a test.
2. RESULTS: Issues a report printout at the following events:
    - start/stop of test
    - status changes
    - error occurrences (selected in the PRINT page all/part set up)
3. EVENTS: Selects events to issue a report printout at:
    - start/stop of test
    - status changes
4. ERR/SECS: Selects err/secs (error seconds) to issue a report printout at:
    - start/stop test
    - status changes
    - error occurrences (selected in the PRINT page all/part configuration field)

    The Error Seconds Report prints a single line of error information for each second in which an error is detected.

Binary 3 Zero Substitution (B3ZS) – A DS3 coding scheme where strings of 3 data 0's are replaced with either a 10V or 00V. V is a data 1 violating AMI coding and the 10V or 00V is output so that the V is the opposite polarity of the last V due to a 3 zero substitution.

Binary 8 Zero Substitution (B8ZS) – A DS1 coding scheme where strings of 8 data 0's are replaced with 000V10V1. V is a data 1 violating AMI.

Bipolar Violation (BPV) – A data 1 pulse that is the same polarity as the last data 1 pulse, and indicates data error or zero substitution.

Bit Error Rate (BER) – Number of errors of a specific type occurring in an interval, e.g., one second, divided by the number of potential error bits in same interval. No bits or errors are counted during loss conditions.

Blue Condition – Same as All Ones Signal except Blue Signal usually refers to DS3 and data is 1010 (not 1111). An all 1's signal indicates a Blue Condition for DS2 and DS1 data rates.

Blue Signal (BLU) – Framed information signal with the information bits set to a 1010... sequence is the minimum requirement. Two additional characteristics may also be required, (1) the 1010... information bit sequence starts with a one ("1") after each overhead bit, (2) the C–bits are set to zero ($c_n=0$ n=1 to 21) and the X–bits are set to one (X1=1 and X2=1). The Digital Transmission Analyzer transmits a blue signal meeting all of these requirements and receives a BLUE signal meeting the minimum requirements.

Error Second (ES) – One second interval containing at least one error of the designated type. Error seconds are counted during loss conditions, per Status Suppression Error. The test set will allow a switch from seconds to deciseconds, 100 ms intervals. All measurements will be referenced to the ES category for the decisecond interval. The beginning of an Error Second is determined by either the Real Time Clock in the asynchronous method, or by the occurrence of an error in the synchronous, or error triggered method.

F–Bit – Any framing bit in the DS hierarchy, or sometimes only those framing bits used for frame synchronization.

Frame Error (00F) – Frame synchronization cannot be recovered from the incoming signal or demultiplexed channel, per AT&T definition.

Gated Error Rate – An error sampling technique in the AT 9500 where the unit counts errors for a 1 second interval then provides an updated error rate for the 1 second interval.

Line–Loop Back (DS1 ESF Transmit Signals) – Line Loop Back "1111111000011110" pattern transmitted on 4 kBit/s data line (Bits M1–M12).

Line–Loop Back Deactivate – "1111111100111000" pattern transmitted on 4 kBit/s data link (Bits M1–M12).

Line–Loop Back (DS1 SF Transmit Signals) – Line–Loop Back is a full-rate (1.544 Mb/s), repeating one in five pattern, "00001", lasting for 5 to 8 seconds. Valid framing bits overwrite the pattern.

Line–Loop Back Restore – A full-rate (1.544 Mb/s), repeating one in three pattern, "001", lasting for 5 to 8 seconds. Valid framing bits overwrite the pattern.

Loss of Signal (LOS) – Incoming signal cannot be detected. Absence of pulses, plus or minus, for more than 150 ms. The circuit indicator clears at the occurrence of a pulse.

Loss/Status Seconds – A second, during which a status item is true for any fraction of the second. This is a test measurement only. All status seconds will be counted independently from other categories of status seconds. Status seconds will be counted by the same algorithm and interval selected for Error Seconds.

Memory Occurrences – For memory status items, a count of false to true transition occurrences will be made. Information in this category is cleared upon Reset/Restart, and counted during a test. With 20 samples per second, the maximum occurrences per second will be ten (10).

Parity Bit – For DS3 the parity of a framing block of 4760 bits is calculated and transmitted in the P framing bits of the following framing block.

Percent Error Free Seconds (%EF) – Error free seconds are computed by determining test seconds; subtract status seconds from elapsed seconds for test seconds. Subtract error seconds from test seconds and divide by test seconds to obtain percent. For Bit Error %, use pattern loss seconds, Code %EF use signal loss seconds. For other error types %EF, use frame loss seconds. Note that %SES (Severely Errored Seconds) would use elapsed seconds for test seconds.

Present Status – LCD display items are updated once per second. LED status indicators show status changes within 250 ms, but not more often than 10 microseconds.

Severely Errored Second (SES) – One second interval with error rate equal to, or in excess of the corresponding SES Threshold, or with occurrence of a loss condition as described in Status Error Suppression.

Status Error Suppression – For error types listed, status conditions suppress error counting and justify an ES and a SES.

F–bit, C–bit, CRC6, Parity Errors, C–bit Parity, X–bit

Signal Loss, Frame Loss:
BPV: Signal Loss
Bit Errors: Signal Loss, Frame Loss, Pattern Loss

Talk–Only Mode – The talk–only device will be under control of printer set–up control. More than one "printer" is allowed, using this mode.

Thresholding Algorithm – At the end of each evaluation interval, e.g., 1 second, and if at least one error occurred during the interval a threshold counter should be incremented. From the error rate for the interval the thresholding algorithm decides which threshold counters to increment:

Severely > Bursty > Dribbling

Example: Severely = 10–2, Bursty = 10–4, Dribbling = 10–8
If error rate equals or exceeds Severely, then increment Severely counter. If BER equals or exceeds Bursty, then increment Bursty counter. If BER equals or exceeds Dribbling, then increment Dribbling counter.

X–bit Alarm – The alarm condition is triggered when the incoming signal has an X–bit toggle from a logic one to a logic zero for DS2 or DS3.

Yellow Signal – A signal transmitted back in the direction of a failure indicating the input from a network element has failed. The yellow signal varies with the type of DS1 framing used.

Zero Suppression – This technique limits the number of consecutive data 0's which may be transmitted. For DS1 without B8ZS, 15 data 0's are the maximum allowed.

APPENDIX C
SIGNAL ANALYSIS OPTION

C.1 GENERAL DESCRIPTION

The Signal Analysis option provides waveform mask compliance measurements and analysis of DS1 and DS3 input signals. This analysis is based on pre-stored waveform templates referenced from Bell Compatibility Bulletin 119 and Publication 62508. A PASS/FAIL indication will be given for +/- Peak Volts, pulse symmetry, and +/- pulse width.

The Signal Analysis option can be used for:

- Measuring the waveform amplitude, pulse symmetry, and pulse width at 25%, 50%, and 75% of pulse amplitude
- Counting the number of parameter failures detected in a timed interval
- Allowing signal frequency to be measured

The input can be live traffic, pseudo-random test patterns, or repeating patterns. Maximum accuracy is obtained using a 1010 pattern. The all ones pattern will yield the least accurate results.

The Signal Analysis option allows unattended long term line monitoring. At the end of the test period the indicators will show if any failures occurred. The operator can then check the printout to determine the exact cause of the failures.

PASS/FAIL determinations are made by comparing peak voltages and six pulse width points against corresponding values in ROM which have been generated from industry standard templates. The measured values are also displayed or printed.

For the PASS/FAIL indication, potential measurement errors are added to the industry standard limits to benefit the PASS condition. Measurement error sources are the accuracy of the signal analysis circuitry, plus return loss and accuracy of the series dropping resistors at the monitor jacks. This assures that a FAIL indication will be shown only for a guaranteed failure condition.

Peak amplitude is measured to 5% accuracy for DSX-1 and DSX-3; +/- 10% accuracy for the DS3-HI, DSX-1/MON and DSX-3/MON. The peak voltage failure points are set as follows:

DSX1	<2.28 Vp(-2.2dB),	or	>3.78 Vp(+2.2dB)
DSX1-MON	<0.192 Vp(-23.7dB),	or	>0.432 Vp(-16.7dB)
DSX3	<0.34 Vp(-4.2dB),	or	>0.89 Vp(+4.2dB)
DSX3-MON	<0.028 Vp(-25.9dB),	or	>0.102 Vp(-14.6dB)
DS3-HI	<0.57 Vp(+0.3dB),	or	>1.44 Vp(+8.4dB)

Pulse width measurement accuracy is +/- 10%. Failure points for pulse width measurements are set 10% below the minimum and 10% above the maximum pulse widths specified by CB-119. A total of six pulse width measurement points are be used in the PASS/FAIL comparison test.

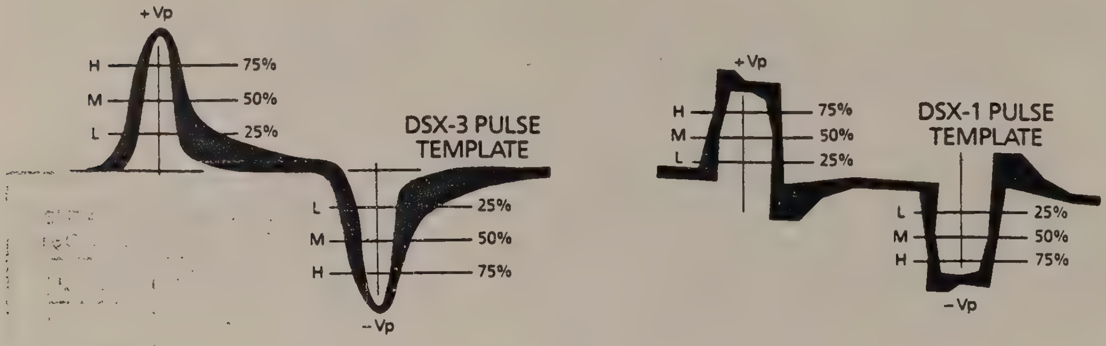


Figure 1. Pulse Templates

The chart below outlines the pulse width failure points for each level:

Signal Type	Width Point	Low FAIL	CB119 Lower Limit	CB119 High Limit	High FAIL
DSX1, DSX1-MON	25%	270ns	300ns	442ns	486ns
	50%	270ns	300ns	406ns	447ns
	75%	217ns	241ns	368ns	405ns
DSX3, DSX3-MON	25%	9.6ns	10.7ns	26.8ns	29.5ns
	50%	7.2ns	8.0ns	16.7ns	16.7ns
	75%	4.8ns	5.3ns	10.0ns	11.0ns
DS3-HI	25%	10.4ns	11.6ns	15.3ns	16.8ns
	50%	9.1ns	10.1ns	12.3ns	13.5ns
	75%	6.4ns	7.1ns	10.8ns	11.9ns

CB-119 states that pulse symmetry must be 0dB +/- 0.5dB. Symmetry measurement error can be 1.0 dB for the PASS/FAIL indicators. Failure will be indicated with a ratio greater than 1.5dB for DSX1, DSX3, and DS3-HI. For DS1 and DS3 Monitor inputs, symmetry FAIL is indicated for a ratio greater than 2.0dB. Pulse symmetry is displayed in dB format and is calculated using:

$$10 \log [(+Vp)^2 (+50\% \text{ width}) / (-Vp)^2 (-50\% \text{ width})]$$

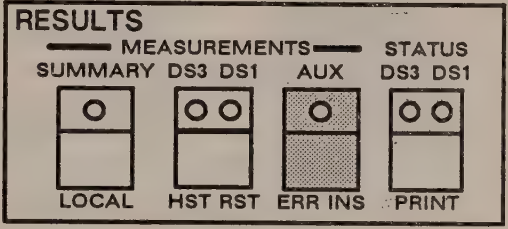
C.1.1 How to Use the Signal Analysis Option

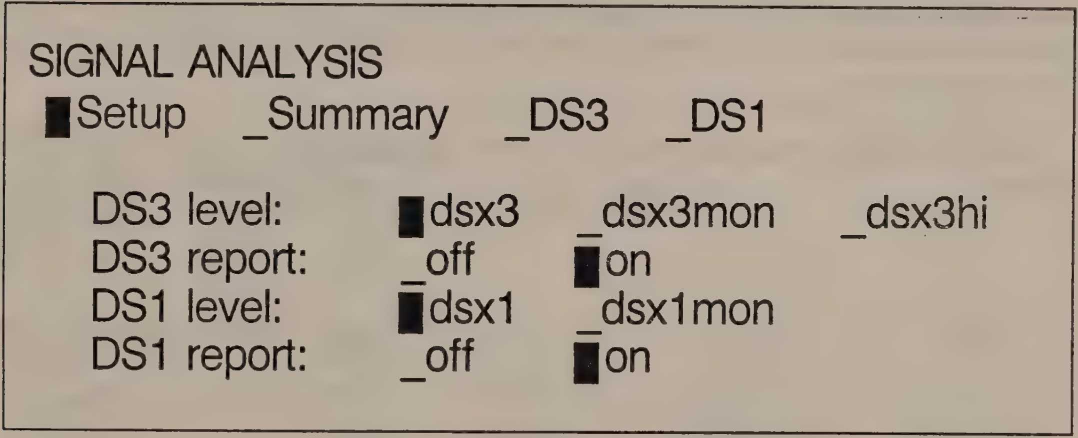
Operating the Signal Analysis feature involves a simple setup procedure and then accessing three mearsurement Results Pages to review test results.

NOTE

The AT 9000 must be in the **STOP** mode before accessing the Signal Analysis option.

To access the Signal Analysis option, press the AUX key. The Display Section will display the **SIGNAL ANALYSIS Setup Page**. The cursor will be located on the Menu line (second line).





```
SIGNAL ANALYSIS
■Setup   _Summary   _DS3   _DS1

   DS3 level:     ■dsx3   _dsx3mon   _dsx3hi
   DS3 report:    _off    ■on
   DS1 level:     ■dsx1   _dsx1mon
   DS1 report:    _off    ■on
```

The Setup Page is used to select the testing level(s) and also to activate the printer so that reports can be printed. When you access the Setup Page, be sure to check the existing defaults (the fields will be highlighted with a box). The defaults will be the same options used in the last testing session unless the parameters have been cleared.

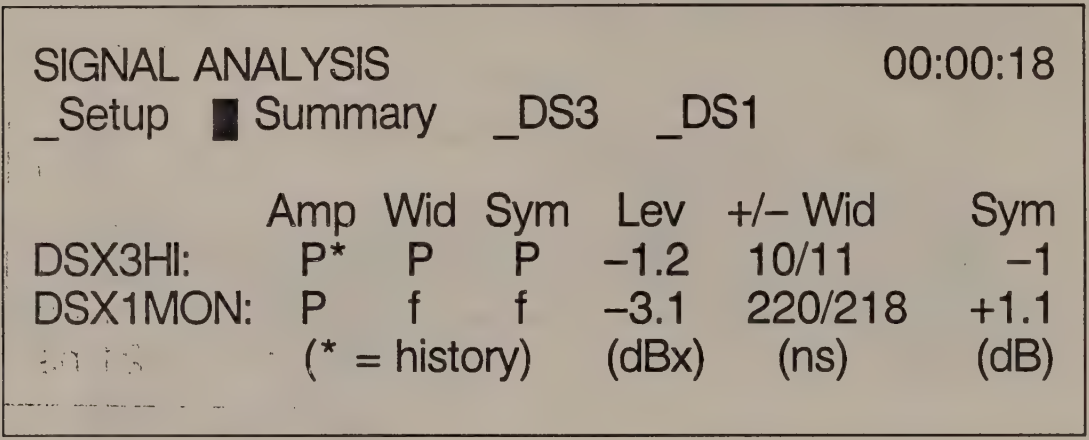
Use the arrow keys to place the cursor in the desired option field and press the **ENTER** key. The options that have been selected will be highlighted with a box.

After selecting the testing level(s) and report printing option(s), use the arrow key to move the cursor back up to the Menu line of the Setup Page.

Connect the input source cable(s) into the appropriate connector(s). See Section **5.2 INPUT AND OUTPUT JACKS** for information about Connectors.

Press **RUN** to begin the test.

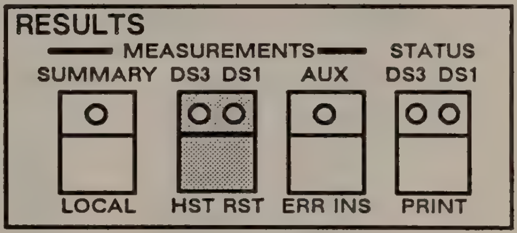
The results of a test can be viewed at any point during the test or after test completion. To access the Summary Page, press the ▶ key so that the cursor is next to Summary on the Menu line.



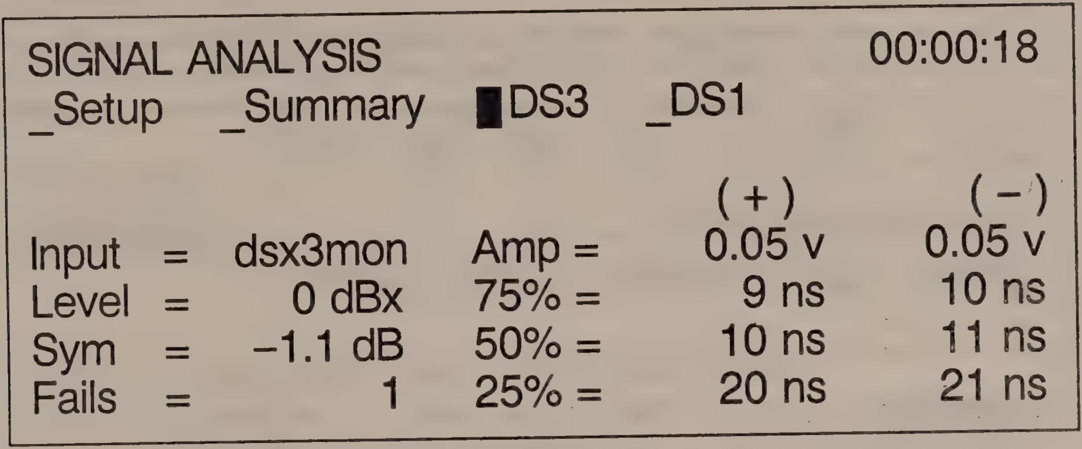
```
SIGNAL ANALYSIS                                    00:00:18
_Setup  █ Summary   _DS3   _DS1

              Amp  Wid  Sym    Lev   +/- Wid      Sym
DSX3HI:       P*   P    P     -1.2   10/11        -1
DSX1MON:      P    f    f     -3.1   220/218     +1.1
              (* = history)   (dBx)   (ns)        (dB)
```

The Summary Page displays PASS/FAIL indicators for the amplitude, width at 50%, and symmetry. It also contains data for the level, +/- width, and symmetry measurement. The asterisk denoting History indicates that a failure has occurred since the last reset even though the current measurement is passing.

To clear the Summary Page parameters, press **SHIFT** and **HST RST**.



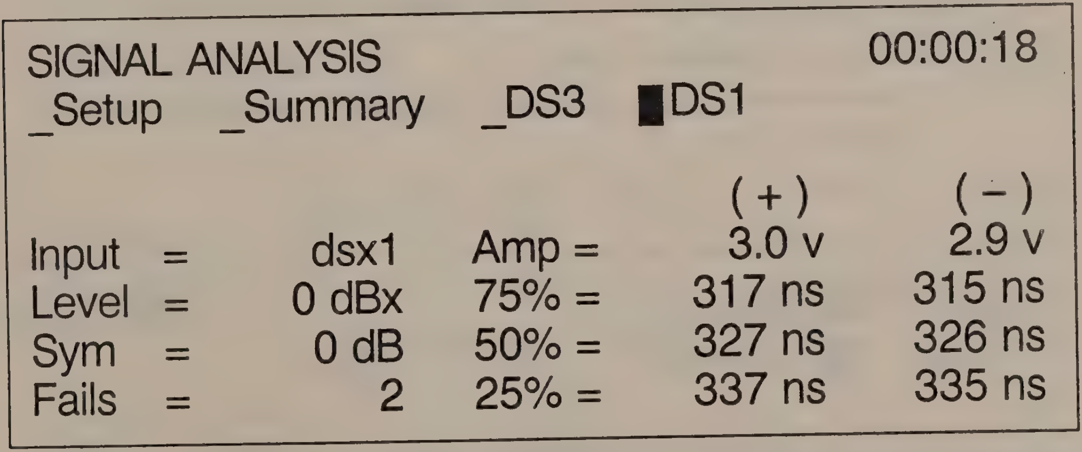
To take a detailed look at the measurement data for the DS3 signal input, press the ▶ key so that the cursor is next to DS3 on the Menu line.



```
SIGNAL ANALYSIS                                 00:00:18
_Setup    _Summary    █DS3    _DS1

                                   (+)          (-)
Input  =  dsx3mon    Amp =      0.05 v       0.05 v
Level  =     0 dBx   75% =         9 ns        10 ns
Sym    =   -1.1 dB   50% =        10 ns        11 ns
Fails  =         1   25% =        20 ns        21 ns
```

The DS3 Results Page provides current measurement data and also indicates how many DS3 waveform failures have occurred during the test.

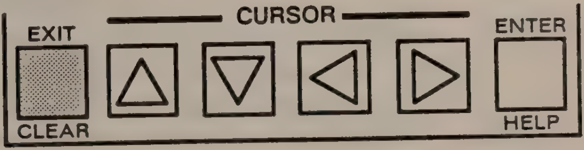
To take a detailed look at the measurement data for the DS1 signal input, press the ▶ key so that the cursor is next to DS1 on the Menu line.



```
SIGNAL ANALYSIS                                 00:00:18
_Setup    _Summary    _DS3    █DS1

                                   (+)          (-)
Input  =      dsx1   Amp =       3.0 v        2.9 v
Level  =     0 dBx   75% =       317 ns       315 ns
Sym    =      0 dB   50% =       327 ns       326 ns
Fails  =         2   25% =       337 ns       335 ns
```

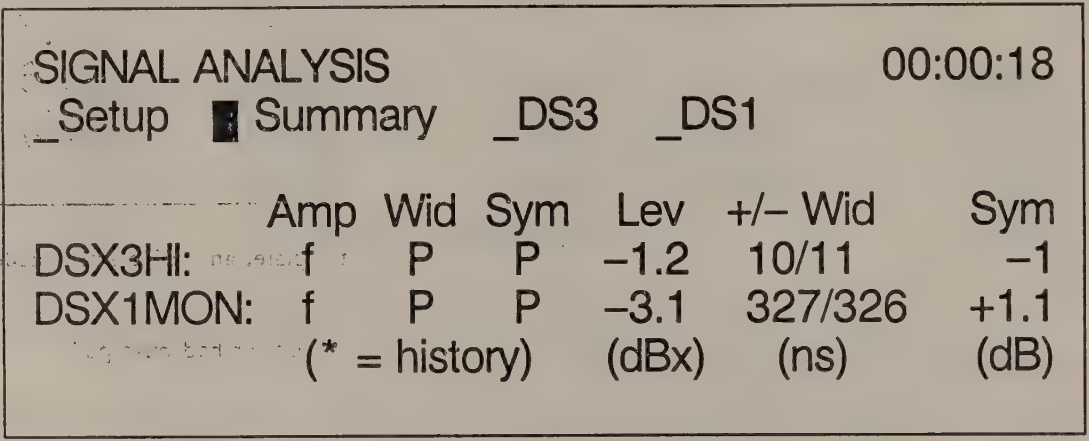
The DS1 Results Page provides current measurement data and also indicates how many DS1 waveform failures have occurred during the test.

To clear all test parameters, press STOP, then press SHIFT and CLEAR.



C.1.2 Interpreting PASS/FAIL Indicators

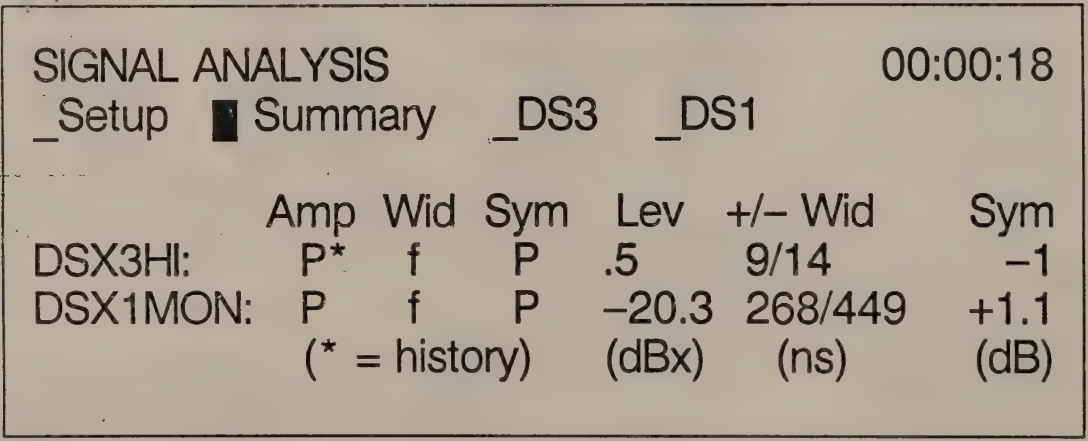
There are seven potential combinations of failed bipolar pulse conditions and many possible causes of the fail indication. There are some identified common causes of failures which should be investigated. The following paragraphs list the fail combinations and possible sources of the problem.



```
SIGNAL ANALYSIS                                   00:00:18
_Setup  █ Summary   _DS3   _DS1

             Amp  Wid  Sym   Lev   +/- Wid     Sym
DSX3HI:      f    P    P     -1.2  10/11        -1
DSX1MON:     f    P    P     -3.1  327/326    +1.1
             (* = history)   (dBx)   (ns)      (dB)
```

Indicates the input waveshape is correct but the amplitude is too small or large.

- Check LBO (equalization) setting.
- Check for excessive cable length from the transmission equipment and the cross-connect bay.



```
SIGNAL ANALYSIS                                   00:00:18
_Setup  █ Summary   _DS3   _DS1

             Amp  Wid  Sym   Lev    +/- Wid    Sym
DSX3HI:      P*   f    P     .5     9/14        -1
DSX1MON:     P    f    P     -20.3  268/449   +1.1
             (* = history)   (dBx)   (ns)      (dB)
```

The amplitude and ratio of = pulse power is within specifications, but the pulse shape is too wide or too narrow.

- Check the high level output of the transmission equipment.

```
SIGNAL ANALYSIS                                    00:00:18
_Setup  ▮ Summary   _DS3   _DS1

             Amp  Wid  Sym   Lev   +/- Wid       Sym
DSX3HI:       f    P    f   -1.2    10/11       -1.7
DSX1MON:      f    P    f   -3.1   327/326      +1.6
             (* = history)  (dBx)    (ns)        (dB)
```

Indicates that the positive or negative pulse is outside of the template, and sufficiently smaller or larger, than the opposite side to cause symmetry failure.

- Check the high level output of the transmission equipment for bad push/pull bipolar amplifiers.

```
SIGNAL ANALYSIS                                    00:00:18
_Setup  ▮ Summary   _DS3   _DS1

             Amp  Wid  Sym   Lev   +/- Wid       Sym
DSX3HI:       f    f    P   -1.2    9/14          -1
DSX1MON:      f    f    P   -3.1   268/449      +1.1
             (* = history)  (dBx)    (ns)        (dB)
```

Implies the positive or negative pulse amplitude is out of specifications and that the opposite pulse is sufficiently wider or narrower to compensate for the amplitude variation to keep the symmetry within specifications. For example, one half of the pulse has greater amplitude and shorter duration than the other half, but they have the same relative power.

- Check LBO (equalization) setting, check for excessive cable length between transmission equipment and the cross-connect bay.
- Check the cable impedance and terminations. Check the dB measurement, if 6 dB too high, check for far end termination.

```
SIGNAL ANALYSIS                                  00:00:18
_Setup  █ Summary   _DS3   _DS1

              Amp  Wid  Sym   Lev    +/- Wid      Sym
DSX3HI:        P*   P    f    .5       10/11     -1.7
DSX1MON:       P    P    f   -20.3   327/326     +1.6
               (* = history)  (dBx)     (ns)      (dB)
```

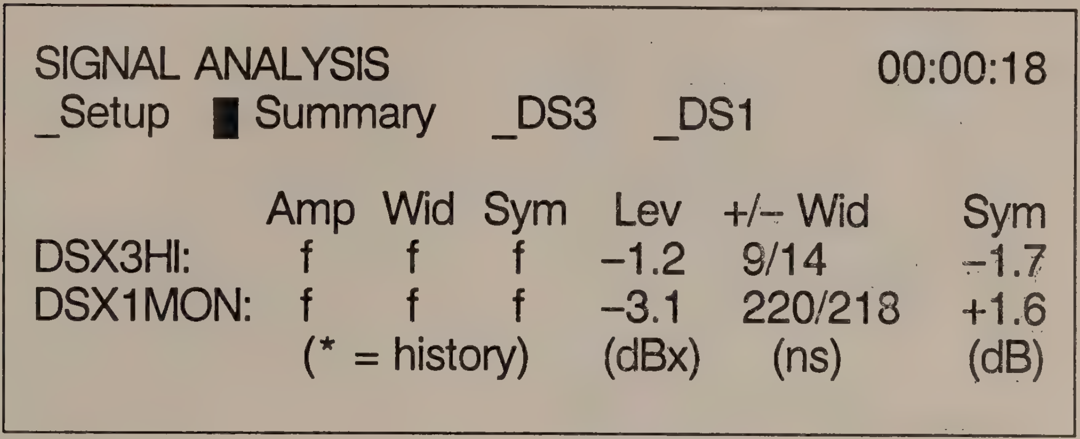
Indicates one side of the pulse is within amplitude and width specifications but near the upper limit, and the other side of the pulse is also within specification but near the lower limit.

- Check the high level output of the transmission equipment.

```
SIGNAL ANALYSIS                                  00:00:18
_Setup  █ Summary   _DS3   _DS1

              Amp  Wid  Sym   Lev    +/- Wid      Sym
DSX3HI:        P*   f    f    .5       9/14      -1.7
DSX1MON:       P    f    f   -20.3   220/218     +1.6
               (* = history)  (dBx)     (ns)      (dB)
```

Indicates a problem with the duty cycle from the transmission equipment.

- Check the high level output of the transmission equipment for bad push/pull bipolar amplifiers.
- Check the cable impedance and terminations.



```
SIGNAL ANALYSIS                                00:00:18
_Setup  █ Summary   _DS3   _DS1

              Amp  Wid  Sym   Lev   +/- Wid      Sym
DSX3HI:        f    f    f   -1.2    9/14       -1.7
DSX1MON:       f    f    f   -3.1   220/218     +1.6
              (* = history)  (dBx)    (ns)       (dB)
```

Indicates that all parameters have failed.

- Check the signal level setting.
- Check the LBO (equalization) setting. Check the cross-connect panel for signal connection and/or proper bridging resistors.
- Check the high level output of the transmission equipment.

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